Drug treatment


Treat-and-extend versus every-other-month regimens with aflibercept in age-related macular degeneration.


PURPOSE: To compare the 1-year outcomes of treat-and-extend (TAE) and every-other-month (2M) regimens with intravitreal aflibercept in Japanese wet age-related macular degeneration (AMD) patients.

METHODS: Prospective, multicenter, randomized clinical trial. The primary outcome measure was the proportion of eyes in which the best-corrected visual acuity (BCVA) was maintained at week 52 [with a loss of <0.3 logarithm of minimum angular of resolution (logMAR) units]. The secondary outcome measures were the mean change from baseline in the central retinal thickness (CRT) and the number of injections.

RESULTS: Forty-one patients were enrolled. The mean changes in the BCVA from baseline in the TAE and 2M were -0.32 ± 0.27 and -0.26 ± 0.30 logMAR units (p = 0.46). The TAE group was noninferior to the 2M group in BCVA maintenance. The mean CRT changes from baseline in the TAE and 2M were -161 ± 133 and -157 ± 90 μm (p = 0.73). The mean number of injections in the TAE and 2M were 7.5 ± 1.2 (range, 7-12) and 8.0 ± 0.0 (p < 0.0001).

CONCLUSION: Treat-and-extend (TAE) regimen with aflibercept improved the BCVA and CRT to the same extent as 2M regimen, with a reduced number of injections.

PMID: 29220114


The VEGF Treatment of AMD Switch Study (The vTAS Study).

Curry B, Bylsma G, Hewitt AW, Verma N.

PURPOSE: To evaluate the effect of aflibercept on anatomic and visual outcomes in patients with choroidal neovascularization (CNV) previously treated with intravitreal ranibizumab with persistent fluid on optical coherence tomography (OCT).

DESIGN: Prospective, open-label study.

METHODS: Eighteen patients (19 eyes) with CNV being treated with monthly ranibizumab, with persistent fluid on OCT, were switched to intravitreal aflibercept injections at intervals of up to 8 weeks. The primary outcome was the proportion of patients maintaining vision [<5 letter loss in visual acuity (VA)] at week 48.
Secondary outcomes included the change in VA and central macular thickness (CMT) and the frequency of treatment necessary along with the safety of intravitreal aflibercept.

RESULTS: Forty-eight weeks after switching to aflibercept, 16/19 eyes had maintained VA. There was a median increase in vision of 5 letters [interquartile range (IQR): 0, 15; P = 0.06]) and median CMT was reduced from 313 µm (IQR: 214, 334) to 258 µm (IQR: 200, 299; P = 0.02). After stratification by fluid location the reduction in CMT was statistically significant for eyes with intraretinal fluid (IRF) at baseline [median change, -25 µm (IQR: -14, -64); P = 0.01]. Macular volume within 6 mm of the fovea (CMTVol) was significantly reduced in eyes with subretinal fluid (SRF) [-0.20 mm³ (IQR: -1.45, -0.05); P = 0.03].

CONCLUSIONS: In this small cohort of eyes, switching to aflibercept seemed beneficial. The majority maintained or improved vision and eyes with IRF or SRF had significant reductions in macular edema. However, visual improvement was not always indicative of anatomical improvement.

PMID: 29204996

Eye (Lond). 2017 Dec 8. [Epub ahead of print]

Exploring factors predicting changes in patients’ expectations and psychosocial issues during the course of treatment with intravitreal injections for wet age-related macular degeneration.

Sii S, Aspinall P, Borooah S, Dhillon B.

Purpose: Patients with wet age-related macular degeneration (AMD) often require long courses of treatment. We investigate the psychosocial issues that could hinder compliance, including patient expectations of treatment. The aims of this study were to explore the factors related to changes in patient expectations, pain, and anxiety during treatment.

Patients and methods: A structured interview was carried out among 50 patients selected from the list attending the AMD unit at the Princess Alexandra Eye Pavilion (PAEP). The interview was based on a questionnaire. Additionally, a visual analogue scale was created as a tool for measuring patient expectations, pain, and anxiety. Data were analysed using multinomial regression analysis.

Results: There were significantly more patients who had a fall in expectations (P<0.05) during the course of treatment. A fall in expectations was found to be predicted by higher starting expectations (P=0.00001), greater decline in visual acuity (P=0.008), and perceived deterioration of vision after starting treatment (P=0.013). Of the patients, 32% planned to stop attending for further injections. Planning to stop attending was correlated with worse final visual acuity (P=0.026, 95% CI). Pain and anxiety with intravitreal therapy (IVT) was significantly reduced when patients were accompanied to the clinic by a friend or relative (P<0.01) using Pearson's correlation (r=0.597).

Conclusion: Patients require appropriate counselling at the start of a course of treatment to align expectations with perceived treatment outcomes in order to improve adherence. Additionally, a large minority of patients would consider stopping treatment. Patients' expectations should be assessed at relevant time points along a course of treatment.Eye advance online publication, 8 December 2017; doi:10.1038/eye.2017.271.

PMID: 29219960


Generative mathematical modelling to demonstrate virtual simulations of neovascular age related macular degeneration.

Hoyle D, Aslam TM.
PURPOSE: To develop a generative mathematical model of wet age-related macular degeneration (AMD) and model the impact of injections of anti-vascular endothelial growth factor to virtual patients with the condition.

METHODS: We isolated key pathophysiological components of macular degeneration in terms of macular edema development and response to anti-vascular endothelial growth factor (VEGF) agents. We developed mathematical models for each of these components using constants determined from published biological experimentation. Consequently, we combined the mathematical models of the separate components to arrive at an end-to-end model of the evolution of macular edema size and its response to treatment.

RESULTS: We present a series of simulations based upon our idealised model. Initially, we demonstrate the theoretical change in macular edema height in wet macular degeneration over time without and with anti-VEGF interventions. In our final simulation, we demonstrate the powerful possibilities of virtual clinical trials by simulating a virtual model of a landmark study using our existing mathematical AMD model.

CONCLUSIONS: Using our mathematical modelling based upon known pathological and pharmacological processes we have been able to model the effect of intravitreal injection of an anti-VEGF agent on macular edema from age related macular degeneration. We were subsequently able to mathematically simulate a major clinical trial with results that mirror many key features of the clinical established study. We anticipate that the generative model presented here can evolve to be a useful supportive tool in the challenge to deliver optimal therapy for patients with wet macular degeneration.

PMID: 29211782


Injections frequency and health care costs in patients treated with aflibercept compared to ranibizumab: new real-life evidence from Switzerland.


BACKGROUND: Previous analyses of real-life data indicated that injection frequency and health care costs did not differ for anti-VEGF treatment with aflibercept and ranibizumab. The objective of this study was to investigate whether this finding persisted when analysing a longer time period after licensing.

METHODS: Retrospective analysis of health insurance claims data of two large Swiss basic health insurance plans including 28% of the Swiss population. Patients qualified for inclusion if aflibercept or ranibizumab treatment had been initiated between June 1, 2013 and November 1, 2014. Within this set, patients with at least 12 months of continuous insurance enrolment in the previous year, 12-month follow-up, and without change of anti-VEGF drug were considered. We examined the distribution of demographic data and patient characteristics between those receiving ranibizumab and those receiving aflibercept. Numbers of injections and associated health care expenditures observed during the 12-month follow-up period after incident treatment were the two outcomes considered. In multivariate regression analyses, controlling for possible confounding factors, we compared differences in these two outcomes between patients treated with aflibercept as compared to ranibizumab.

RESULTS: A total of 3'058 patients were analysed, 790 (26%) receiving aflibercept and 2'268 receiving ranibizumab (74%). The use of aflibercept (average number of injections 6.2) as compared to ranibizumab (average number of injections 5.7) in the follow-up period of 1 to 12 months, was associated with a 12% increase in the injection frequency (95% confidence interval (CI) 6-17%; p < 0.001).

CONCLUSIONS: Real-life data contradicts the assumption that aflibercept is used less frequently as compared to ranibizumab. This results in similar total health care expenditures for both anti-VEGF agents.

PMID: 29202760 PMCID: PMC5715627
The impact of different anti-vascular endothelial growth factor treatment regimens on reducing burden for caregivers and patients with wet age-related macular degeneration in a single-center real-world Japanese setting.

Hanemoto T, Hikichi Y, Kikuchi N, Kozawa T.

OBJECTIVE: To describe the burden associated with different anti-vascular endothelial growth factor (VEGF) treatment strategies for wet age-related macular degeneration (wAMD) in a real-world setting in Japan.

METHODS: Single-center, cross-sectional survey of caregivers of patients with wAMD performed in a hospital in Mito-City, a rural area in Japan. Caregiver burden was evaluated using the Burden Index of Caregivers (BIC-11), and depressive symptoms were assessed by the Center for Epidemiologic Studies Depression scale. Retrospective medical chart review was conducted to monitor resource use and visual acuity outcomes in patients. The productivity loss of caregivers accompanying patients on hospital visits was estimated using the human capital method.

RESULTS: Seventy-one patient-caregiver pairs were included. Most caregivers were female (74.6%), spouse/partner (54.9%), employed (46.5%), and the primary caregiver (85.9%). Patients received anti-VEGF treatment as follows: treat-and-extend (T&E; n = 42), switch (from as-needed [PRN] to T&E; n = 18), PRN (n = 10), and other (n = 1). Caregiver-related burden (total BIC-11 scores) were 4.29 (T&E) 4.60 (PRN), and 5.33 (switch) (p = NS). The mean number of hospital visits was lower with T&E than PRN (7.88 vs. 14.0 [p = 0.00674] in year 1 and 5.68 vs. 9.0 in year 2). For patients who switched from PRN to T&E, the mean number of hospital visits decreased from 13.21 to 7.43 (p<0.0001) in the first year after switch. The productivity loss associated with accompanying patients to the hospital was lower for caregivers of patients receiving T&E than PRN (mean differences: 74,456.04 JPY [p = 0.00284] in year 1 and 40843.14 JPY in year 2), and was also reduced for caregivers of patients who switched from PRN to T&E.

CONCLUSION: wAMD treatment with anti-VEGF agents via T&E reduced hospital visits compared with PRN, where associated monitoring visits are necessary to provide good patient outcomes. T&E was associated with a reduction trend in caregiver burden, including time and costs.

PMID: 29220371


Choroidal Changes after Suprachoroidal Injection of Triamcinolone in Eyes with Macular Edema Secondary to Retinal Vein Occlusion.

Willoughby AS, Vuong VS, Cunefare D, Farsiu S, Noronha G, Danis RP, Yiu G.

PURPOSE: To evaluate choroidal and suprachoroidal changes following suprachoroidal injection of triamcinolone acetonide injectable suspension (CLS-TA), in eyes with macular edema due to retinal vein occlusion (RVO).

DESIGN: Prospective cohort study within a randomized, controlled phase 2 clinical trial.

METHODS: Enhanced-depth imaging optical coherence tomography (EDI-OCT) images were analyzed from 38 eyes of 38 treatment naïve patients with macular edema due to RVO, enrolled in the prospective Suprachoroidal Injection of Triamcinolone Acetonide with Intravitreal Afibercept in Subjects with Macular Edema Due to Retinal Vein Occlusion (TANZANITE) study who received either a suprachoroidal injection of CLS-TA with an intravitreal injection of afibercept (combination arm) or only an intravitreal injection of afibercept (monotherapy arm) followed by monthly intravitreal afibercept injections in both arms based on pro re nata (PRN) criteria.
RESULTS: Macular choroidal thickness measured to the outer choroidal vessel lumen (vascular choroidal thickness, VCT), outer choroid stroma (stromal choroidal thickness, SCT), or inner scleral border (total choroidal thickness, TCT) showed no significant changes over 3 months in both study arms (P = 0.231-0.342). Eyes that received combination therapy showed a trend toward thickening of the suprachoroidal space (SCS) compared with monotherapy alone (13.4 μm vs 5.3 μm at 3 months; P=0.077). In the 15 eyes that demonstrated a visible SCS at baseline, the SCS expanded significantly after suprachoroidal CLS-TA injection (16.2 μm to 27.8 μm at 3 months; P=0.033).

CONCLUSIONS: Suprachoroidal injection of CLS-TA does not alter choroidal thickness in eyes with macular edema due to RVO, but may result in expansion of the SCS.

PMID: 29199012


Photodynamic therapy combined with antivascular endothelial growth factor treatment for recalcitrant chronic central serous chorioretinopathy.

Asahi MG, Chon AT, Gallemore E, Gallemore RP.

PURPOSE: To determine whether combination photodynamic therapy (PDT) and antivascular endothelial growth factor (VEGF) therapy is effective in the management of chronic central serous chorioretinopathy (CSC) recalcitrant to conventional therapy.

METHODS: This was a retrospective analysis of eight patients with chronic CSC unresponsive to topical nonsteroidal anti-inflammatory drugs, focal photocoagulation, anti-VEGF alone, or PDT alone. All patients were evaluated with a full ophthalmic examination, spectral-domain optical coherence tomography (OCT), fluorescein angiography (FA), and most with indocyanine green angiography (ICGA) followed by treatment with half-fluence PDT and intravitreal anti-VEGF injection (seven bevacizumab, one aflibercept). Patients were seen in follow-up 1 month after treatment.

RESULTS: All eight patients achieved complete resolution in subretinal fluid following combination treatment. Average duration of CSC prior to initiation of combination therapy was 7.5 months. Mean central macular thickness on OCT decreased significantly from 401.2±52.7 μm to 297.9±18.2 μm (p=0.0010) by 4 months after treatment (1.63±1.18 months). Seven of eight patients were followed up for an average of 13 months with no recurrence during that time. One case recurred at 8 months and was treated with repeat combination at that time. Frank choroidal neovascularization (CNV) was not identified in these cases on FA or ICGA studies. Eight of eight patients showed significant improvement in vision from a logMAR of 0.1125±0.099 to 0.0125±0.064 (p=0.019).

CONCLUSION: Combination PDT and anti-VEGF is effective for chronic CSC which has failed conventional therapy. Associated CNV and/or inflammation may be reasons for greater success in patients treated with combination therapy.

PMID: 29200818 PMCID: PMC5701552


Update on the Use of Anti-VEGF Intravitreal Therapies for Retinal Vein Occlusions.

Jiang Y, Mieler WF.

Abstract: The use of anti-vascular endothelial growth factor (VEGF) therapy in ophthalmology has profoundly changed our management and treatment of conditions such as cystoid macular edema, diabetic macular edema, choroidal neovascularization, and other proliferative retinopathies. Although initially used
for the treatment of choroidal neovascularization in neovascular age-related macular degeneration, their application has spread rapidly for other indications as their outcomes have often outperformed previously existing treatments. Retinal vein occlusion (RVO) continues to be one of the leading causes of vision loss secondary to macular edema, in addition to macular ischemia and neovascularization in more severe cases. Before the availability of anti-VEGF therapy, the use of macular grid laser and panretinal photocoagulation was the mainstay of treatment of macular edema and neovascularization, respectively, in patients with RVOs. Two landmarks studies established the guidelines of these treatments for nearly a quarter century. Since the availability of anti-VEGF agents, there has been a paradigm shift in the treatment of RVO. Most importantly, there has also been a significant improvement in visual outcomes in these patients. The goal of this article is to provide a review of the pertinent clinical studies that have investigated the use of anti-VEGF in patients with retinal vein occlusions.

PMID: 29204993


Characterization of liposomal carriers for the trans-scleral transport of Ranibizumab.

Joseph RR, Tan DWN, Ramon MRM, Natarajan JV, Agrawal R, Wong TT, Venkatraman SS.

Abstract: Age-related macular degeneration (AMD) is a leading cause of blindness in the modern world. The standard treatment regimen for neovascular AMD is the monthly/bimonthly intravitreal injection of anti-VEGF agents such as ranibizumab or aflibercept. However, these repeated invasive injections can lead to sight-threatening complications. Sustained delivery by encapsulation of the drug in carriers is a way to reduce the frequency of these injections. Liposomes are biocompatible, non-toxic vesicular nanocarriers, which can be used to encapsulate therapeutic agents to provide sustained release. The protein encapsulation was performed by a modified dehydration-rehydration (DRV) method. The liposomes formed were characterized for size, zeta potential, encapsulation efficiency, stability, in vitro release, and ex vivo release profiles. In addition, the localization of the liposomes themselves was studied ex vivo. Entrapment-efficiency of ranibizumab into 100-nm liposomes varied from 14.7 to 57.0%. Negatively-charged liposomes prepared from DPPC-DPPG were found to have the slowest release with a low initial burst release compared to the rest of liposomal formulations. The ex vivo protein release was found to slower than the in vitro protein release for all samples. In conclusion, the DPPC-DPPG liposomes significantly improved the encapsulation and release profile of ranibizumab.

PMID: 29196745 PMCID: PMC5711922

Other treatment & diagnosis

Retina. 2017 Nov 23. [Epub ahead of print]

COMBINED AUTOLOGOUS TRANSPLANTATION OF NEUROSENSORY RETINA, RETINAL PIGMENT EPITHELIUM, AND CHOROID FREE GRAFTS.


PURPOSE: To evaluate the feasibility and initial functional and anatomical outcomes of transplanting a full-thickness free graft of choroidal and retinal pigment epithelium (RPE), along with neurosensory retina in advanced fibrosis and atrophy associated with end-stage exudative age-related macular degeneration with and without a concurrent refractory macular hole. METHODS: During vitrectomy, an RPE-choroidal and neurosensory retinal free graft was harvested in nine eyes of nine patients. The RPE-choroidal and neurosensory retinal free graft was either placed subretinally (n = 5), intraretinally to cover the foveal area inside an iatrogenically induced macular hole over the RPE-
choroidal graft (n = 3) or preretinally (n = 1) without a retinotomy wherein both free grafts were placed over the concurrent macular hole. Silicone oil endotamponade was used in all cases.

RESULTS: Mean follow-up was 7 ± 5.5 months (range 3-19). The mean preoperative visual acuity was ~count fingers (logarithm of the minimum angle of resolution = 2.11, range 2-3), which improved to ~20/800 (logarithm of the minimum angle of resolution 1.62 ± 0.48, range 0.7-2, P = 0.04). Vision was stable in 5 eyes (55.6%) and improved in 4 eyes (44.4%). Reading ability improved in 5 eyes (55.6%). Postoperative complications were graft atrophy (n = 1), epiretinal membrane (n = 1), and dislocation of neurosensory retina-choroid-RPE free graft (n = 1).

CONCLUSION: Combined autologous RPE-choroid and neurosensory retinal free graft is a potential surgical alternative in eyes with end-stage exudative age-related macular degeneration, including concurrent refractory macular hole.

PMID: 29210941

Retina. 2017 Dec 5. [Epub ahead of print]

IMAGING OF VITELLIFORM MACULAR LESIONS USING POLARIZATION-SENSITIVE OPTICAL COHERENCE TOMOGRAPHY.

Deák GG, Schmidt WM, Bittner RE, Mylonas G, Roberts PK, Zotter S, Baumann B, Pircher M, Hitzenberger CK, Schmidt-Erfurth UM, Ritter M.

PURPOSE: To examine the involvement of the retinal pigment epithelium (RPE) in the presence of vitelliform macular lesions (VML) in Best vitelliform macular dystrophy (BVMD), autosomal recessive bestrophinopathy, and adult-onset vitelliform macular degeneration using polarization-sensitive optical coherence tomography (PS-OCT).

METHODS: A total of 35 eyes of 18 patients were imaged using a PS-OCT system and blue light fundus autofluorescence imaging. Pathogenic mutations in the BEST1 gene, 3 of which were new, were detected in all patients with BVMD and autosomal recessive bestrophinopathy.

RESULTS: Polarization-sensitive optical coherence tomography showed a characteristic pattern in all three diseases with nondepolarizing material in the subretinal space consistent with the yellowish VML seen on funduscopy with a visible RPE line below it. A focal RPE thickening was seen in 26 eyes under or at the edge of the VML. Retinal pigment epithelium thickness outside the VML was normal or mildly thinned in patients with BVMD and adult-onset vitelliform macular degeneration but was diffusely thinned or atrophic in patients with autosomal recessive bestrophinopathy. Patients with autosomal recessive bestrophinopathy showed sub-RPE fibrosis alongside the subretinal VML. Polarization-sensitive optical coherence tomography was more reliable in assessing the localization and the integrity of the RPE than spectral domain OCT alone. On spectral domain OCT, identification of the RPE was not possible in 19.4% of eyes. Polarization-sensitive optical coherence tomography allowed for definite identification of the location of VML in respect to the RPE in all eyes, since it provides a tissue-specific contrast.

CONCLUSION: Polarization-sensitive optical coherence tomography confirms in vivo the subretinal location of VML and is useful in the assessment of RPE integrity.

PMID: 29215532

Retina. 2017 Nov 23. [Epub ahead of print]

VASCULAR REMODELING OF CHOROIDAL NEOVASCULARIZATION AFTER ANTI-VASCULAR ENDOTHELIAL GROWTH FACTOR THERAPY VISUALIZED ON OPTICAL COHERENCE TOMOGRAPHY.

PMID: 29210941
TOMOGRAPHY ANGIOGRAPHY.

Miere A, Butori P, Cohen SY, Semoun O, Capuano V, Jung C, Souied EH.

PURPOSE: To describe the qualitative and quantitative changes in choroidal neovascularization (CNV) flow pattern after anti-vascular endothelial growth factor therapy, by optical coherence tomography angiography (OCTA).

METHODS: Consecutive patients with neovascular age-related macular degeneration underwent multimodal imaging, including OCTA at initial examination and at last visit. High-flow networks in the choriocapillaris segmentation of OCTA were qualitatively and quantitatively analyzed at baseline and at follow-up, to characterize vascular flow changes after anti-vascular endothelial growth factor treatment and to correlate these changes with final exudation signs on spectral domain optical coherence tomography.

RESULTS: Seventeen eyes were included. Mean follow-up was of 11.7 ± 3.3 months. Baseline images showed six medusa pattern (35.3%), four seafan pattern (23.5%), and seven indistinct network patterns (41.2%). Mean CNV area at baseline was 1.58 ± 1.72 mm. Final OCTA images revealed a decrease in CNV total area of 21.6%. In 6/17 eyes, the baseline neovascular pattern was unchanged; these cases were associated with exudation at the final spectral domain optical coherence tomography examination (P = 0.034) and a decrease in CNV area of 34.1%. Conversely, in 11/17 eyes (64.7%), the initial pattern had changed to a pruned vascular tree pattern, with variable exudative status on spectral domain optical coherence tomography at the final visit and a decrease in total CNV area of 0.07%.

CONCLUSION: The vascular flow remodeling induced by recurrent anti-vascular endothelial growth factor treatment can be assessed by OCTA. Optical coherence tomography angiography may help to accurately evaluate treatment response and to recognize patterns usually associated with recurrent exudative activity.

PMID: 29210939

Retina. 2017 Nov 23. [Epub ahead of print]

OPTICAL COHERENCE TOMOGRAPHY AND HISTOLOGY OF AGE-RELATED MACULAR DEGENERATION SUPPORT MITOCHONDRIA AS REFLECTIVITY SOURCES.

Litts KM, Zhang Y, Freund KB, Curcio CA.

PURPOSE: Widespread adoption of optical coherence tomography has revolutionized the diagnosis and management of retinal disease. If the cellular and subcellular sources of reflectivity in optical coherence tomography can be identified, the value of this technology will be advanced even further toward precision medicine, mechanistic thinking, and molecular discovery. Four hyperreflective outer retinal bands are created by the exquisite arrangement of photoreceptors, Müller cells, retinal pigment epithelium, and Bruch membrane. Because of massed effects of these axially compartmentalized and transversely aligned cells, reflectivity can be localized to the subcellular level. This review focuses on the second of the four bands, called ellipsoid zone in a consensus clinical lexicon, with the central thesis that mitochondria in photoreceptor inner segments are a major independent reflectivity source in this band, because of Mie scattering and waveguiding.

METHODS: We review the evolution of Band 2 nomenclature in published literature and discuss the origins of imaging signals from photoreceptor mitochondria that could make these organelles visible in vivo.

RESULTS: Our recent data pertain to outer retinal tubulation, a unique neurodegenerative and gliotic structure with a highly reflective border, prominent in late age-related macular degeneration. High-resolution histology and multimodal imaging of outer retinal tubulation together provide evidence that inner segment mitochondria undergoing fission and translocation toward the nucleus provide the reflectivity signal.
CONCLUSION: Our data support adoption of the ellipsoid zone nomenclature. Identifying subcellular signal sources will newly inform clinical.

PMID: 29210936

**J Digit Imaging. 2017 Dec 4. [Epub ahead of print]**

**Automated Segmentation and Quantification of Drusen in Fundus and Optical Coherence Tomography Images for Detection of ARMD.**

Khalid S, Akram MU, Hassan T, Jameel A, Khalil T.

Abstract: Age-related macular degeneration (ARMD) is one of the most common retinal syndromes that occurs in elderly people. Different eye testing techniques such as fundus photography and optical coherence tomography (OCT) are used to clinically examine the ARMD-affected patients. Many researchers have worked on detecting ARMD from fundus images, few of them also worked on detecting ARMD from OCT images. However, there are only few systems that establish the correspondence between fundus and OCT images to give an accurate prediction of ARMD pathology. In this paper, we present fully automated decision support system that can automatically detect ARMD by establishing correspondence between OCT and fundus imagery. The proposed system also distinguishes between early, suspect and confirmed ARMD by correlating OCT B-scans with respective region of the fundus image. In first phase, proposed system uses different B-scan based features along with support vector machine (SVM) to detect the presence of drusens and classify it as ARMD or normal case. In case input OCT scan is classified as ARMD, region of interest from corresponding fundus image is considered for further evaluation. The analysis of fundus image is performed using contrast enhancement and adaptive thresholding to detect possible drusens from fundus image and proposed system finally classified it as early stage ARMD or advance stage ARMD. The proposed system is tested on local data set of 100 patients with 100 fundus images and 6800 OCT B-scans. Proposed system detects ARMD with the accuracy, sensitivity, and specificity ratings of 98.0, 100, and 97.14%, respectively.

PMID: 29204763

**J Fr Ophtalmol. 2017 Nov 28. [Epub ahead of print]**

**Clinical and imaging findings of pattern dystrophy subtypes; Diagnostic errors and unnecessary treatment in clinical practice.**

Ozkaya A, Garip R, Nur Tarakcioglu H, Alkin Z, Taskapili M.

PURPOSE: To evaluate the clinical and multimodal imaging findings of various pattern dystrophy (PD) subtypes and report the initial misdiagnosis rate of PD patients resulting in unnecessary treatment in actual clinical practice.

METHODS: Retrospective, observational study. Forty eyes of 24 patients with PD were included. The distribution of PD subtypes, optical coherence tomography (OCT) and fundus autofluorescence (FAF) findings, initial misdiagnoses, revised diagnoses, duration between misdiagnosis and revised diagnosis, and unnecessary treatments administered were evaluated over this time-period.

RESULTS: Twenty-eight eyes (70%) showed adult-onset foveomacular vitelliform dystrophy, 6 eyes (15%) showed butterfly PD (BPD), 4 eyes (10%) showed reticular PD, and 2 eyes (5%) showed PD simulating fundus flavimaculatus and BPD mixed type PD. Most of the patients showed various types of hyperreflective material in the subretinal space on OCT, and hyperautofluorescence on FAF imaging. Eighteen eyes (45%) had a true PD diagnosis initially, whereas 22 (55%) of them were misdiagnosed as age-related macular degeneration, central serous chorioretinopathy, or non-specific RPE change. The
mean duration between the initial and revised diagnosis was 18.7±16.8 months. In addition, 5 eyes in the misdiagnosed group underwent intravitreal anti-vascular endothelial growth factor treatment during this period.

CONCLUSION: Pattern dystrophies are a heterogeneous group of macular disorders which may mimic several macular diseases. By knowing the multimodal imaging findings, especially the distinctive FAF findings of the PDs, we may easily diagnose the disease and save our patients from unnecessary treatments.

PMID: 29195727


Macular Atrophy Development and Subretinal Drusenoid Deposits in Anti-Vascular Endothelial Growth Factor Treated Age-Related Macular Degeneration.

Zarubina AV, Gal-Or O, Huisingh CE, Owsley C, Freund KB.

PURPOSE: To explore the association between presence of subretinal drusenoid deposits (SDD) at baseline in eyes with neovascular age-related macular degeneration (nAMD) with the development of macular atrophy (MA) during anti-vascular endothelial growth factor (VEGF) therapy.

METHODS: There were 74 eyes without pre-existing MA receiving anti-VEGF therapy for nAMD for 2 years or longer analyzed. At least two image modalities that included spectral-domain optical coherence tomography, near-infrared reflectance, fluorescein angiography, and color fundus photos were used to assess for SDD presence, phenotype (dot and ribbon), and location, neovascularization type, and MA. Logistic regression models using generalized estimating equations assessed the association between SDD and the development of MA adjusting for age, neovascularization type, and choroidal thickness.

RESULTS: SDD were present in 46 eyes (63%) at baseline. MA developed in 38 eyes (51%) during the mean of 4.7 ± 1.2 years of follow-up. Compared with eyes without SDD, those with SDD at baseline were 3.0 times (95% confidence interval [CI] 1.1-8.5, P = 0.0343) more likely to develop MA. Eyes with SDD present in the inferior macula and inferior extramacular fields at baseline were 3.0 times and 6.5 times more likely to develop MA at follow-up than eyes without SDD in these locations (95% CI 1.0-8.9, P = 0.0461 and 95% CI 1.3-32.4, P = 0.0218, respectively). MA development was not associated with a specific SDD phenotype.

CONCLUSIONS: MA frequently developed in eyes during anti-VEGF treatment. SDD were independently associated with MA development. The extension of SDD into the inferior fundus, particularly in the inferior extramacular field, conferred higher odds of subsequent MA development.

PMID: 29196768 PMCID: PMC5710629


Current Care Guideline: Age-related macular degeneration (AMD).

[No authors listed]

Abstract: Age-related macular degeneration (AMD) is the main cause of visual impairment in developed countries. Several improvements in the visualization of posterior segment of the eye together with the introduction of intravitreal anti-VEGF treatment have revolutionized the prognosis of the wet form of AMD (wAMD). Increasing incidence of wAMD together with the limited resources of the healthcare systems pose challenges for the provision and development of care. In context of these current aspects, we aim to set evidence-based guidelines for diagnosis, treatment and follow-up of patients with wAMD.

PMID: 29205985

Imaging of Exudative Age-Related Macular Degeneration: Toward a Shift in the Diagnostic Paradigm?

[No authors listed]
PMID: 29206718

Pathogenesis

Ophthalmologe. 2017 Dec 7. [Epub ahead of print]

[Chemokines in ophthalmology]. [Article in German]

Bleul T, Schlunck G, Reinhard T, Lapp T.

Abstract: Chemokines are chemotactically active cytokines, which coordinate the distribution of immune cells within the body and also regulate the migration of leukocytes in malignant and inflammatory processes. Chemokines are a heterogeneous group of short-chain proteins that are divided into different subgroups on the basis of their structure. In addition to the chemokines (ligands) various chemokine receptors also exist. The chemokine system is given its complexity by the high redundancy of ligand-receptor interactions: one single ligand can bind to different receptors and a single receptor can interact with different ligands. In terms of receptors, distinct immune cell types have characteristic receptor expression patterns, which can be used for the immunological characterization of leukocytes. Important basic research is currently leading to a better understanding of the chemokine system. The essential importance of the chemokine system in various diseases of the anterior and posterior eye segments is becoming increasingly apparent. The following synopsis explains the individual clinical aspects as well as the underlying scientific work in the context of "chemokines in ophthalmology".

PMID: 29218607


Cytochrome b5 protects photoreceptors from light stress-induced lipid peroxidation and retinal degeneration.

Chen X, Hall H, Simpson JP, Leon-Salas WD, Ready DF, Weake VM.

Abstract: Lipid peroxides are generated by oxidative stress in cells, and contribute to ageing and neurodegenerative disease. The eye is at special risk for lipid peroxidation because photoreceptors possess amplified sensory membranes rich in peroxidation-susceptible polyunsaturated fatty acids. Light-induced lipid peroxidation in the retina contributes to retinal degeneration, and lipid peroxidation has been implicated in the progression of age-associated ocular diseases such as age-related macular degeneration (AMD). Here, we show that exposing Drosophila melanogaster to strong blue light induces oxidative stress including lipid peroxidation that results in retinal degeneration. Surprisingly, very young flies are resilient to this acute light stress, suggesting they possess endogenous neuroprotective mechanisms. While lipophilic antioxidants partially suppressed blue light-induced retinal degeneration in older flies, we find that overexpression of cytochrome b5 (Cyt-b5) completely suppressed both blue light-induced lipid peroxidation and retinal degeneration. Our data identify Cyt-b5 as a neuroprotective factor that targets light-induced oxidative damage, particularly lipid peroxidation. Cyt-b5 may function via supporting antioxidant recycling, thereby providing a strategy to prevent oxidative stress in ageing photoreceptors that would be synergistic with dietary antioxidant supplementation.

PMID: 29214051 PMCID: PMC5712525
Curr Mol Med. 2017 Dec 5. [Epub ahead of print]

miR-25 mediates retinal degeneration via inhibiting ITGAV and PEDF in rat.


Abstract: Age-related macular degeneration (AMD) is the main cause of irreversible blindness in the elderly. Oxidative stress in retinal pigment epithelium (RPE) is deemed to play a pivotal role in the pathogenesis of AMD. miR-25 functions as an essential modulator in response to oxidative-stress in several cell types, but its function in RPE cells is poorly understood. Here, we reported that, in a rat model of retinal degeneration induced by sodium iodate (SI), oxidative stress up-regulated miR-25 in RPE cells in very early stage, accompanied by decreased phagocytosis and reduced growth factor secretion in those cells. Such changes preceded RPE cell apoptosis and visual impairment in the SI-treated rats. Furthermore, antagomiR-25 intervention effectively rescued RPE cells from degeneration in such model. The increased miR-25 was confirmed to mediate RPE degeneration through direct targeting integrin αV (ITGAV) and pigment epithelium derived factor (PEDF). On the other hand, upstream, miR-25 was found to be up-regulated by STAT3 signaling under oxidative stress in both in vivo and in vitro models. Our findings demonstrate that, in SI-treated rats, oxidative stress activates STAT3 signaling which up-regulates miR-25 expression, in a very early stage. The increased miR-25 then inhibits ITGAV and PEDF expressions, resulting in RPE phagocytosis dysfunction and then RPE apoptosis and visual impairment as observed in patients with AMD. These findings lead us to a better understanding of AMD pathogenesis, and suggest that miR-25 could be a potential therapeutic target for oxidative stress related RPE diseases, like AMD.

PMID: 29210651


Retinal pigment epithelium in the pathogenesis of age-related macular degeneration and photobiomodulation as a potential therapy?

Ao J, Wood JP, Chidlow G, Gillies MC, Casson RJ.

Abstract: The retinal pigment epithelium (RPE) comprises a monolayer of cells located between the neuroretina and the choriocapillaries. The RPE serves several important functions in the eye: formation of the blood retinal barrier, protection of the retina from oxidative stress, nutrient delivery and waste disposal, ionic homeostasis, phagocytosis of photoreceptor outer segments, synthesis and release of growth factors, reisomerization of all-trans-retinal during the visual cycle, and establishment of ocular immune privilege. Age-related macular degeneration (AMD) is the leading cause of blindness in developed countries. Dysfunction of the RPE has been associated with the pathogenesis of AMD in relation to increased oxidative stress, mitochondrial destabilization and complement dysregulation. Photobiomodulation or near infrared light therapy which refers to non-invasive irradiation of tissue with light in the far-red to near-infrared light spectrum (630-1000 nm), is an intervention that specifically targets key mechanisms of RPE dysfunction that are implicated in AMD pathogenesis. The current evidence for the efficacy of photobiomodulation in AMD is poor but its safety profile and proposed mechanisms of action motivate further research as a novel therapy for AMD.

PMID: 29205705


Protective effects of 6-ureido/thioureido-2,4,5-trimethylpyridin-3-ols against 4-hydroxynonenal-induced cell death in adult retinal pigment epithelial-19 cells.

Abstract: Dysfunction or progressive degeneration of retinal pigment epithelium (RPE) contributes in the initial pathogenesis of age-related macular degeneration (AMD) causing irreversible vision loss, which makes RPE the prime target of the disease. The present study aimed to identify compounds to protect 4-hydroxynonenal (4-HNE)-induced RPE cell death by inhibiting NADPH oxidase 4 (NOX4) activity, not just as free radical scavengers, using ARPE-19, a human adult retinal pigment epithelial cell line, as a RPE representative. Novel thirty-two 6-ureido/thiourea-2,4,5-trimethylpyridin-3-ol derivatives 17 were synthesized and tested. We found that there was a strong correlation between level of protective effect of compounds 17 against 4-HNE-induced APRE-19 cell death and that of inhibitory activity against 4-HNE-induced superoxide production, and that most of the compounds 17 showed minimal DPPH radical scavenging activity. Compound 17-28 showed the best protective activity against 4-HNE-induced superoxide production (79.5% inhibition) and cell death (85.1% recovery) at 10 μM concentration, which was better than that of VAS2870, a NOX2/4 inhibitor. In addition, compound 17-28 blocked 4-HNE-induced apoptosis of ARPE-19 cells in a concentration-dependent manner. The results indicate that compound 17-28 may be a lead compound to develop AMD therapeutics.

PMID: 29208521


Inhibition of Laser-Induced Choroidal Neovascularization by Hematoporphyrin Dimethylether-Mediated Photodynamic Therapy in Rats.

Yan YJ, Bao LL, Zhang LJ, Bian J, Hu TS, Zheng MZ, Chen DY, Yu XH, Chen ZL.

Abstract: This study aimed to investigate the effect of hematoporphyrin dimethylether (HDME)-mediated photodynamic therapy for laser-induced choroidal neovascularization (CNV) in adult Brown Norway rats. HDME was administered via tail vein at 14 d after the laser photocoagulation, and the rats received irradiance with a laser light at 570 nm at 15 min after injection. CNV was evaluated by fundus photography, fundus fluorescein angiography, optical coherence tomography, and hematoxylin and eosin staining. We found that CNV was occurred at 7 d after photocoagulation and reaching peak activity at 14 d after photocoagulation. There is a significant reduction in the total area of the fluorescein leakage and the number of strong fluorescein leakage spots on 7 d after HDME-mediated photodynamic therapy (PDT). The results suggest that HDME-mediated PDT inhibits laser-induced CNV in rats, representing a promising therapy for wet age-related macular degeneration.

PMID: 29199233


Mammalian Target of Rapamycin (mTOR) as a Potential Therapeutic Target in Pathological Ocular Angiogenesis.

Nakahara T, Morita A, Yagasaki R, Mori A, Sakamoto K.

Abstract: Pathological ocular angiogenesis is a causative factor of retinopathy of prematurity, proliferative diabetic retinopathy, and wet age-related macular degeneration. Vascular endothelial growth factor (VEGF) plays an important role in pathological angiogenesis, and anti-VEGF agents have been used to treat the ocular diseases that are driven by pathological angiogenesis. However, adverse effects associated with the blockade of VEGF signaling, including impairments of normal retinal vascular growth and retinal function, were suggested. Therefore, the development of a safe, effective strategy to prevent pathological ocular angiogenesis is needed. Recent studies have demonstrated that inhibitors of the mammalian target of
rapamycin (mTOR) target proliferating endothelial cells within the retinal vasculature. Here, we review the potential of targeting the mTOR pathway to treat pathological ocular angiogenesis.

PMID: 29199229


AAV-CRISPR/Cas9-Mediated Depletion of VEGFR2 Blocks Angiogenesis In Vitro.
Wu W, Duan Y, Ma G, Zhou G, Windhol C, D'Amore PA, Lei H.

PURPOSE: Pathologic angiogenesis is a component of many diseases, including neovascular age-related macular degeneration, proliferation diabetic retinopathy, as well as tumor growth and metastasis. The purpose of this project was to examine whether the system of adeno-associated viral (AAV)-mediated CRISPR (clustered regularly interspaced short palindromic repeats)-associated endonuclease (Cas)9 can be used to deplete expression of VEGF receptor 2 (VEGFR2) in human vascular endothelial cells in vitro and thus suppress its downstream signaling events.

METHODS: The dual AAV system of CRISPR/Cas9 from Streptococcus pyogenes (AAV-SpGuide and -SpCas9) was adapted to edit genomic VEGFR2 in primary human retinal microvascular endothelial cells (HRECs). In this system, the endothelial-specific promoter for intercellular adhesion molecule 2 (ICAM2) was cloned into the dual AAV vectors of SpGuide and SpCas9 for driving expression of green fluorescence protein (GFP) and SpCas9, respectively. These two AAV vectors were applied to production of recombinant AAV serotype 5 (rAAV5), which were used to infect HRECs for depletion of VEGFR2. Protein expression was determined by Western blot; and cell proliferation, migration, as well as tube formation were examined.

RESULTS: AAV5 effectively infected vascular endothelial cells (ECs) and retinal pigment epithelial (RPE) cells; the ICAM2 promoter drove expression of GFP and SpCas9 in HRECs, but not in RPE cells. The results showed that the rAAV5-CRISPR/Cas9 depleted VEGFR2 by 80% and completely blocked VEGF-induced activation of Akt, and proliferation, migration as well as tube formation of HRECs.

CONCLUSIONS: AAV-CRISPR/Cas9-mediated depletion of VEGFR2 is a potential therapeutic strategy for pathologic angiogenesis.

PMID: 29204648 PMCID: PMC5714046


Oxidative stress and reactive oxygen species: a review of their role in ocular disease.

Abstract: For many years, oxidative stress arising from the ubiquitous production of reactive oxygen species (ROS) has been implicated in the pathogenesis of various eye diseases. While emerging research has provided some evidence of the important physiological role of ROS in normal cell function, disease may arise where the concentration of ROS exceeds and overwhelms the body's natural defence against them. Additionally, ROS may induce genomic aberrations which affect cellular homoeostasis and may result in disease. This literature review examines the current evidence for the role of oxidative stress in important ocular diseases with a view to identifying potential therapeutic targets for future study. The need is particularly pressing in developing treatments for conditions which remain notoriously difficult to treat, including glaucoma, diabetic retinopathy and age-related macular degeneration.

PMID: 29203723
Genetics & gene therapy


Association of ARMS2 genotype with response to anti-vascular endothelial growth factor treatment in polypoidal choroidal vasculopathy.

Park UC, Shin JY, Chung H, Yu HG.

BACKGROUND: To investigate whether genetic risk variants for age-related macular degeneration (AMD) are associated with response to intravitreal anti-vascular endothelial growth factor (VEGF) in polypoidal choroidal vasculopathy (PCV) patients.

METHODS: This prospective cohort study included 95 treatment-naïve patients that underwent anti-VEGF treatment for PCV for 12 months. Patients were genotyped for 10 single nucleotide polymorphisms in eight AMD-relevant genes. Genotypic association with visual and anatomic outcome measures at 12 months after initial treatment, including mean change in best-corrected visual acuity (BCVA) and total foveal thickness, visual gain of ≥ 15 letters, dry status on optical coherence tomography (OCT), pigment epithelial detachment (PED) regression on OCT, polyp regression on indocyanine green angiography, and injection numbers, were investigated using regression models with adjustment for non-genetic covariates under additive genetic model.

RESULTS: In 81 patients who completed 12-month anti-VEGF monotherapy without photodynamic therapy, significant pharmacogenetic association was found between ARMS2 rs10490924 and PED regression on OCT. Proportions of PED regression were 26.4% for TT, 45.7% for TG, and 63.6% for GG genotype, showing additive effect of G allele for higher chance of PED regression (OR, 2.96; 95% CI, 1.38-6.36; corrected P = 0.043). For entire 95 patients, no significant association was found between candidate polymorphisms and receiving photodynamic therapy within 12 months.

CONCLUSIONS: In PCV patients, ARMS2 rs10490924 showed association with anatomic therapeutic response to anti-VEGF, suggesting pharmacogenetic relationship.

PMID: 29212537 PMCID: PMC5719580

Prog Retin Eye Res. 2017 Nov 29. [Epub ahead of print]

Towards the application of precision medicine in age-related Macular Degeneration.


Abstract: The review essentially describes genetic and non-genetic variables contributing to the onset and progression of exudative Age-related Macular Degeneration (AMD) in Italian population. In particular, AMD susceptibility within Italian population is contributed to by genetic variants, accounting for 23% of disease and non-genetic variants, accounting for 10% of AMD. Our data highlighted prominent differences concerning genetic and non-genetic contributors to AMD in our cohort with respect to worldwide populations. Among genetic variables, SNPs of CFH, ARMS2, IL-8, TIMP3, SLC16A8, RAD51B, VEGFA and COL8A1 were significantly associated with the risk of AMD in the Italian cohort. Surprisingly, other susceptibility variants described in European, American and Asiatic populations, did not reach the significance threshold in our cohort. As expected, advanced age, smoking and dietary habits were associated with the disease. In addition, we also describe a number of gene-gene and gene-phenotype interactions. In fact, AMD-associated genes may be involved in the alteration of Bruch's membrane and induction of angiogenesis, contributing to exacerbate the damage caused by aging and environmental factors. Our review provides an overview of genetic and non-genetic factors characterizing AMD susceptibility in Italian population, outlining the differences with respect to the worldwide populations.
Altogether, these data reflect historical, geographic, demographic and lifestyle peculiarities of Italian population. The role of epigenetics, pharmacogenetics, comorbidities and genetic counseling in the management of AMD patients have been described, in the perspective of the application of a “population-specific precision medicine” approach addressed to prevent AMD onset and improve patients’ quality of life.

PMID: 29197628

**Stem cells**

Regen Med. 2017 Dec 6. [Epub ahead of print]

*Lessons for reviewing clinical trials using induced pluripotent stem cells: examining the case of a first-in-human trial for age-related macular degeneration.*

Takashima K, Inoue Y, Tashiro S, Muto K.

PMID: 29210321


*Unproven stem cell therapy for macular degeneration.*

Ansari ZA, Kuriyan AE, Albini TA.

PMID: 29207592 PMCID: PMC5710873

**Diet, lifestyle & low vision**

Antioxidants (Basel). 2017 Dec 4;6(4).

*Effects of the Macular Carotenoid Lutein in Human Retinal Pigment Epithelial Cells.*

Gong X, Draper CS, Allison GS, Marisiddaiah R, Rubin LP.

Abstract: Retinal pigment epithelial (RPE) cells are central to retinal health and homoeostasis. Oxidative stress-induced damage to the RPE occurs as part of the pathogenesis of age-related macular degeneration and neovascular retinopathies (e.g., retinopathy of prematurity, diabetic retinopathy). The xanthophyll carotenoids, lutein and zeaxanthin, are selectively taken up by the RPE, preferentially accumulated in the human macula, and transferred to photoreceptors. These macular xanthophylls protect the macula (and the broader retina) via their antioxidant and photo-protective activities. This study was designed to investigate effects of various carotenoids (β-carotene, lycopene, and lutein) on RPE cells subjected to either hypoxia or oxidative stress, in order to determine if there is effect specificity for macular pigment carotenoids. Using human RPE-derived ARPE-19 cells as an in vitro model, we exposed RPE cells to various concentrations of the specific carotenoids, followed by either graded hypoxia or oxidative stress using tert-butyl hydroperoxide (tBHP). The results indicate that lutein and lycopene, but not β-carotene, inhibit cell growth in undifferentiated ARPE-19 cells. Moreover, cell viability was decreased under hypoxic conditions. Pre-incubation of ARPE-19 cells with lutein or lycopene protected against tBHP-induced cell loss and cell co-exposure of lutein or lycopene with tBHP essentially neutralized tBHP-dependent cell death at tBHP concentrations up to 500 μM. Our findings indicate that lutein and lycopene inhibit the growth of human RPE cells and protect the RPE against oxidative stress-induced cell loss. These findings contribute to the understanding of the protective mechanisms attributable to retinal xanthophylls in eye health and retinopathies.

PMID: 29207534
Prevention of Age-Related Macular Degeneration.

Singh N, Srinivasan S, Muralidharan V, Roy R, V J, Raman R.

Abstract: Age-related macular degeneration (AMD) compromises quality of life. However, the available therapeutic options are limited. This has led to the identification of modifiable risk factors to prevent the development or alter the natural course and prognosis of AMD. The identification and modification of risk factors has the potential for greater public health impact on reducing morbidity from AMD. Likewise, identifying the imaging clues and genetic clues could serve as a guide to recognizing the propensity for progression to severe and end stages of the disease. Several attempts, both successful and unsuccessful, have been made for interventions that could delay the progression of AMD. Of these, pharmacological interventions have shown promising results. The Age-Related Eye Disease Study 1 and 2 have shown the beneficial role of antioxidants in a selected group of patients.

PMID: 29204995

Associations between fruit and vegetable, and antioxidant nutrient intake and age-related macular degeneration by smoking status in elderly Korean men.

Kim EK, Kim H, Vijayakumar A, Kwon O, Chang N.

BACKGROUND: Age-related macular degeneration (AMD) is one of the major causes of irreversible blindness. The objective of this study was to determine whether there is any relationship between dietary intake of fruits and vegetables (F&V) and antioxidant nutrients including carotenoids and AMD according to smoking status in elderly men.

METHODS: We performed a cross-sectional analysis using nationally representative samples of elderly aged ≥ 65 years (n = 1414) from the Korea National Health and Nutrition Examination Survey (KNHANES, 2010-2012).

RESULTS: The current smokers consumed less food in total, and, in particular, less cereals/potatoes/sugar products, fruits and vegetables than the nonsmokers and former smokers (p < 0.05). Intake of energy, thiamin, vitamin C, vitamin A, and β-carotene were significantly lower in the current smokers than in the nonsmokers and the former smokers. For current smokers, the ORs of the highest tertile compared with the lowest tertile were 0.36 (95% CI: 0.14-0.96, p for trend = 0.0576) for F&V, 0.32 (95% CI: 0.12-0.85, p for trend = 0.0561) for vitamin C, 0.23 (95% CI: 0.08-0.67, p for trend = 0.0038) for α-carotene, 0.13 (95% CI: 0.04-0.46, p for trend = 0.0003) for β-carotene after adjusting for confounding factors. In contrast, there was no association between antioxidant nutrient intake and AMD among the nonsmokers and former smokers.

CONCLUSIONS: These results suggest that increased consumption of fruits and vegetables containing antioxidant components such as vitamin C, α-carotene, and β-carotene may have a protective effect on AMD. These effects may be more evident among current smokers.

PMID: 29202844 PMCID: PMC5715512

Disclaimer: This newsletter is provided as a free service to eye care professionals by the Macular Disease Foundation Australia. The Macular Disease Foundation cannot be liable for any error or omission in this publication and makes no warranty of any kind, either expressed or implied in relation to this publication.