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Optometría y Visión
Facultad de Óptica y Optometría

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PRÓLOGO

Por tercera vez los doctorandos de la Facultad de Óptica y Optometría de la Universidad Complutense de Madrid cuentan con un congreso propio organizado por y para ellos, el 3rd PhDAY- FOO. Al igual que en las ediciones anteriores, en las que tuvimos mucho éxito, en esta edición jóvenes científicos podrán presentar sus investigaciones al resto de sus compañeros predoctorales y a toda la comunidad universitaria que quiera disfrutar de este evento.

Además de los propios estudiantes de doctorado, serán especialmente invitados los estudiantes de Máster de la Facultad por ser ellos la cantera de futuros doctorandos del multidisciplinar Programa de Doctorado en Óptica, Optometría y Visión.

En esta tercera edición del PhDAY-FOO que tendrá lugar el 07 de noviembre de 2019 en la Facultad de Óptica y Optometría de la UCM se llevarán a cabo varias sesiones de presentaciones, orales y póster, donde los doctorandos mostrarán la gran diversidad y riqueza de líneas de investigación incluidas en nuestro programa de doctorado en las que están trabajando.

Se pretende difundir el trabajo desarrollado por los doctorandos de nuestra Facultad y a la vez contribuir a mejorar sus habilidades comunicadoras como científicos. Ésta es una ocasión estupenda para promover la interacción entre los asistentes, favoreciendo el intercambio de experiencias, estrategias y sensaciones vinculadas a su actividad investigadora; quizá incluso surjan nuevas amistades, sinergias o proyectos.

Tanto si llevas varios años como doctorando, como si acabas de llegar al programa de doctorado, no debes faltar pues, tras haber conocido a otros compañeros en tu misma situación, seguro que no te sentirás tan solo cuando estés en tu laboratorio y será una estupenda toma de contacto con la que será tu labor académica-investigadora en los próximos años hasta desembocar en la presentación de tu tesis doctoral.

Si eres un estudiante de Máster, en pocos meses te encontrarás con la opción de proseguir tu trayectoria como universitario hasta alcanzar el máximo nivel de estudios y ser Doctor, y esta jornada PhDAY-FOO te puede ayudar a tomar esta decisión; ya sea porque directamente te gustaría estar en su lugar y dedicarte a la investigación o porque, al menos, sabrás a quién dirigir algunas de tus dudas.

Profesores, estudiantes de Grado, PAS de la Facultad de Óptica y Optometría seréis bienvenidos a este congreso donde podréis conocer de la mano de sus protagonistas la variada investigación que se desarrolla vinculada a nuestro Programa de Doctorado.

Desde el Equipo Decanal de la Facultad de Óptica y Optometría y en particular, desde mi papel como Vicedecana de Posgrado e Investigación y Coordinadora del Programa de Doctorado quiero agradecer la buena acogida que esta iniciativa ha tenido entre los doctorandos y en especial, agradecer al Comité Organizador toda su dedicación para que este 3rd PhDAY- FOO consiga los objetivos buscados.

Beatriz Antona Peñalba
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AGRADECIMIENTOS

El Comité Organizador quisiera agradecer tanto a la Escuela de Doctorado de la Universidad Complutense, como a las distintas empresas patrocinadoras y a la Asociación de Fotografía de la Facultad de Óptica y Optometría el apoyo ofrecido para llevar a cabo las jornadas PhDay-FOO, sin el cual, éstas no hubieran podido realizarse.

PONENCIA INVITADA

"CIENCIA, DIVULGACIÓN Y DOCTORADO"

Por: María Viñas Peña

Comenzar tu carrera investigadora y empezar una tesis doctoral puede ser una de las aventuras más fascinantes y gratificantes de tu carrera profesional. Las fronteras de tu conocimiento se expanden de manera significativa, así como tu crecimiento personal y profesional. Sin embargo, tu periodo como investigador pre-doctoral te ofrece muchas más opciones para crecer que el mero desarrollo de tu carrera profesional. ¡Hay vida más allá de nuestros laboratorios! Formarte como un buen científico y ser consciente de la necesidad de divulgar la Ciencia y tu proyecto científico, en particular, es inherente a un buen comienzo de tu formación como investigador. Ciencia, divulgación y doctorado son tres conceptos que van de la mano.

María Viñas Peña

Doctora en Ciencias Físicas por la Universidad Complutense de Madrid con la tesis titulada "Polychromatic Adaptive Optics to evaluate the impact of manipulated optics on vision". Máster en Ingeniería Óptica y Grado en Óptica por la misma universidad. Investigadora Postdoctoral, Laboratorio de Óptica Visual y Biofotónica, Instituto de Óptica, Consejo Superior de Investigaciones Científicas (IO-CSIC).

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Doctora en Ciencias Biológicas por la UCM con la tesis titulada "Desarrollo de la musculatura intrínseca ocular en el embrión de pollo". Es Profesora Titular de la Facultad de Óptica y Optometría, donde imparte docencia en las asignaturas "Anatomía humana" y "Anatomía del sistema visual" "Morfogénesis y malformaciones oculares. Neuroanatomía y alteraciones visuales" . Integrante del "Grupo Investigación en Desarrollo del Paladar y Fisura Palatina. Desarrollo Craneofacial

Agustín González Cano

Doctor en Ciencias Físicas por la Universidad Complutense (1994) y Catedrático de EU de la Facultad de Óptica y Optometría de dicha Universidad. Miembro del Grupo Complutense de Óptica Aplicada y responsable en él de la línea de investigación en sensores de fibra óptica, ha publicado varias decenas de artículos en revistas internacionales y ha liderado diversos proyectos de investigación dentro de ese campo. Profesor de la UCM desde 1987, ha participado en numerosas asignaturas, estando asignada su docencia este curso en "Óptica Geométrica" e "Historia de la Óptica", dentro el Grado en Óptica y Optometría y "Procesado de Imágenes" y "Métodos Ópticos de

medida", dentro el Máster en Tecnología Óptica y de la Imagen, titulaciones ambas impartidas en la Facultad de Óptica y Optometría.

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Doctora en Ciencias Físicas por la Universidad de Valencia con la tesis titulada "Determinación" in vivo" de la Función de Transferencia de modulación (MTF) de los medios oculares" y Diplomada en Óptica y Optometría por dicha Universidad. Profesora Titular de la Facultad de Óptica y Optometría, donde imparte las asignaturas "Óptica Oftálmica I y II". En la actualidad, directora del Departamento Optometría y Visión de la UCM. Su actividad investigadora está enfocada en el estudio de la superficie ocular y, en particular, en su interacción con la lente de contacto.

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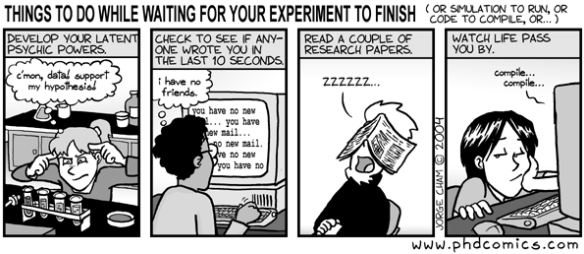

PROGRAMA

9:00 Entrega de documentación

9:30 Presentación y bienvenida

Mª Isabel Sánchez Pérez
Decana de la Facultad de Óptica y Optometría

María Luisa Lucía Mulas
Vicerrectora de Estudios

María Teresa González Jaén
Directora de la Escuela de Doctorado UCM

10:00 – 11:15 Sesión 1 de Ponencias Orales

10:00: Gold nanoparticle-based colorimetric biosensor for dry eye diagnosis
Carlos Carpena Torres

10:15: Clinical Evaluation of an Innovative Optics Design Multifocal Scleral Lens
Ana Privado Aroco

10:30: Automatic classification of Meibomian Glands
Elena Diz Arias

10:45: Processing and analysis of endoscopic hyperspectral larynx imagery
Juan Luis Méndez González

11:00: Turno de preguntas

11:15 – 12:00: Sesión de Pósteres y Pausa café

- CISS vs $CISS_{VE}$ Comparison
  Carlos Pérez Garmendia
- Dry eye and electronic devices
  Gema Martínez Florentín
- The Topographical Effect of Optical Zone Diameter in Orthokeratology Contact Lenses in High Myopes
  Teresa Espinosa Vidal
- Assessment of Meibomian Gland Dropout Through Two Types of Meibography Images
  Elena Fernández Jiménez
- Evaluation of the anti-inflammatory effect of an ophthalmic tear substitute based on a combination of Aloe vera and Hydroxy-propylmethylcellulose.
  Candela Rodríguez Pómar
- Corneal curvature and aberration changes after scleral lens wear in keratoconus patients
  María Serramito Blanco
- Assessment of contrast percepcion in mesopic conduction of Aloe vera and Hydroxypropylmethylcellulose.
  Marta García Rojo
- The Effect of Wearing Two Different Designs of Soft Contact Lenses on Myopia Control: 2 Years Follow up
  Wael Hassan Almalki
- Myopia boom: risk factors and new tech devices
  Juan Oliveros López
- Visual implications for school performance
  Nadiuska Cristine Platero Alvarado
- Influence of a game battery on reading comprehension and saccadic eye movements in primary students
  Fernando Javier Gómez Sanz
- Ocular Surface condition in pediatric patients.
  Beatriz Martín García

12:00 – 13:30 Sesión 2 de Ponencias Orales

12:00: Effect of melatonin and its analogues: agomelatine, IIK7 and 5MCA-NAT in the tear secretion
Francisco Javier Navarro Gil

12:15: Optical and Visual quality with multifocal contact lenses
Shrileka Vedhakrishnan

12:30: Development of an LSPR-based sensor for the detection of acanthamoeba
Cristina Pastrana Robles

12:45: Visual function in patients with keratoconus before and after implantation of intrastromal rings
Rafael Bella Gala

13:00: Light, yellow filter and darkness effects on PIO and melatonin
Victoria Eugenia Lledó Mayáns

13:15: Turno de preguntas

13:30: Conferencia invitada: *Ciencia, divulgación y doctorado*

María Viñas Peña
Instituto de Óptica – CSIC

14:00: Turno de preguntas/debate

14:15: Clausura y entrega de premios

Mª Isabel Sánchez Pérez
Decana de la Facultad de Óptica y Optometría
Beatriz Antona Peñalba
Vicedecana de Posgrado e Investigación. Coordinadora del Programa de Doctorado en Óptica, Optometría y Visión

PONENCIAS ORALES

Gold nanoparticle-based colorimetric biosensor for dry eye diagnosis

Carlos Carpena Torres,[1,2],* Joana Rafaela Guerreiro,[2] Cristina Pastrana Robles[1], Marta Prado Rodríguez,[2] Lorenzo Pastrana Castro,[2] Juan Gonzalo Carracedo Rodríguez[1]
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Introduction

Diadenosine tetraphosphate (Ap4A) is a biomarker molecule that is abnormally elevated in tears of patients diagnosed with dry eye. The detection of Ap4A allows the diagnosis with a sensitivity of 74% and a specificity of 96% [1].

Gold nanoparticles (GNP) have been extensively explored due to their optical properties, which make them attractive for optical biosensing applications [3]. GNP color change according to their aggregation state, red when disperse and purple upon aggregation.

Here, it is purposed the colorimetric detection of Ap4A biomarker with GNP for dry eye diagnosis.

Method

GNP were functionalized with peptides acting as recognition elements which interact specifically with Ap4A providing a color change.

The interaction between the peptide and the Ap4A was evaluated with circular dichroism (CD) spectroscopy. The increasing concentration of Ap4A caused a slight conformational change in the peptide indicating the specific interaction.

Spherical GNP were synthesized and characterized by ultraviolet-visible spectroscopy and dynamic light scattering (DLS). These GNP showed a maximum extinction of 524.92 ± 0.03 nm (red color) and a diameter of 20 nm. Upon characterization, the GNP surface was loaded with peptide though a **sulfur-gold** bond. Peptide loading on GNP caused an increase of 6.52 ± 0.79 nm of the particle average size determined by DLS. At this stage GNP/peptide functionalized nanoparticles were red, which would only turn purple in the presence of Ap4A due to the aggregation of the GNP.

Conclusions

The specificity of the system, based on peptide and Ap4A interaction, will allow the development of a colorimetric/naked eye system for dry eye diagnosis.

References

[1] Carracedo G, Crooke A, Guzman-Aranguez A et al. (2016). The role of dinucleoside polyphosphates on the ocular surface and other eye structures. Progress in Retinal and Eye Research, 55: 182-205.

[2] Nie L, Liu F, Ma P et al (2014). Applications of gold nanoparticles in optical biosensors. Journal of Biomedical Nanotechnology, 10(10): 2700-2721.

Clinical Evaluation of an Innovative Optics Design Multifocal Scleral Lens.

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Introduction

The advantages of multifocal contact lenses are numerous, including the ability to provide simultaneous vision and, according to Woods et al (2009) [1], patients prefer visual acuity with multifocal over monovision contact lenses for most activities (included both daytime and nighttime driving, watching television, and changing focus from distance to near); multifocal contact lenses are preferred even if visual acuity was better with monovision than with multifocal lens correction.

According to the Tear Film and Ocular Surface Society (TFOS), the reason for contact lens dropout is multifactorial [2]. In patients under the age of 45, comfort issues are the main reason for contact lens dropout. After age 45, vision and comfort are almost equally stated as the reason for contact lens dropout [3]. Scleral lenses are able to provide excellent vision and comfort as well as treat ocular surface disorders. Nowadays, there are a multitude of scleral lens options in a multifocal design. ONEFIT MED is a new multifocal scleral lens design with a decentered optic zone. From the point of view of optical quality, it is expected that this new design will be more efficient, since the decentred optic of the lens would produce a decrease in aberrations. Kim, Bakaraju et al. (2016) [4] evaluated the effect of decentering a multifocal soft contact lens and their results showed statistical significance in the sphere power when the lens was decentered more than 0.2–0.3 mm. In this study, it was found that decentration affects more the negative spherical aberration.

However, before the study begins, we must find a method to quantify the decentration of these lenses and which should be available to all the professionals who adapt them in their optics or clinics.

Method

Initially, 20 subjects without ocular surface anomalies will be enrolled at the Faculty of Optics and

Optometry of the Complutense University of Madrid. These patients will be fitted with the OnefitMED lens following the manufacturer's adaptation guide.

Firstly, the decentration of the lens will be measured with the slit lamp, using a reticle adapted to one of the eyepieces and manufactured specifically for it (in this way we will quantify the decentration in a subjective way). After that, we will take a photo using the biomicroscope which will be analyzed later with an image processing software (in this way the decentration will be quantified objectively). Finally, both results will be compared to assess the repeatability of the subjective measure.

Results

We still do not have the final results.

Conclusions

According to the results obtained we will be able to say if this new method quantifies in a correct way the decentration of this new multifocal scleral lens design with a decentered optic zone.

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Automatic classification of Meibomian Glands

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Introduction

Meibography is a useful tool in the diagnosis of alterations in Meibomian glands that may lead to conditions such as Meibomian Glands Dysfunction and dry eye disease. The analysis of the eyelid images comprises the evaluation of the lid margins, and the assessment of the Meibomian glands by the eye care practitioner [1]

To capture the images of the eyelids and the MGs we have developed a custom non-contact meibographer that uses a white light source combined with a red bandpass filter to produce the images of the Meibomian Glands.

In this work, we propose an approach based on a convolutional neural network which allows the classification of Meibomian gland images in the five-degree scale proposed by Pult and Rieder-Pult [2].

Methods

Three convolutional neural networks for image classifying, AlexNet, VGG19, and GoogLeNet, have been modified for the task of grading Meibomian gland images.

To train and verify these networks, we have used a set of 2779 images of the Meibomian Glands taken in a clinical study with 61 subjects. We have trained five times the classifiers using different training and validation sets in order to assess the repeatability of the classifiers using different training and validation sets in order to assess the repeatability of the classifiers.

Results

We have obtained a maximum accuracy of 99,5 % in grading the Meibomian Gland images for the modified version of the VGG19. Similar but lower accuracies were obtained for the AlexNet and GoogLeNet classifiers. In all cases, we obtained a good repeatability with an estimation of the RMS of the accuracy lower than 1,5 %

Conclusions

We have proved the feasibility of using convolutional neural networks for the automatic grading Meibomian gland images in Pult and Riede-Pult five degree scale [2].

References

[1] Arita R, Minoura I, Morishige N, Shirakawa R et al. 2016.Development of definitive and reliable grading scales for Meibomian Gland Dysfunction, Am J Ophthalmol; 169:125-137

[2] Pult H, and Riede-Pult B. 2013 Comparison of subjective grading and objective assessment in meibography, Contact Lens & Anterior Eye; 36:22-27.

"Processing and analysis of endoscopic hyperspectral larynx imagery"

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Introduction

Head and neck squamous cell carcinoma accounts for over 350,000 deaths and approximately 630,000 new cases every year[1] but so far, early detection is still limited to subjective white light visual inspection of the mucosa.

Newer techniques include autofluorescence, narrow band imaging (NBI) and HyperSpectral Imaging (HSI)[2], which collecting spatial and spectral information has the ability to capture spectral differences that other techniques will miss. However, interpretability still remains an issue.

This study aims to review and apply machine learning techniques for segmentation and semantical classification of laryngeal HSI, as well as the development of the necessary preprocessing algorithms that deal with the challenging variability of in-vivo medical imagery.

Methods

Our study comprises over 800 captures from more than 500 patients. For acquisition, the larynx was sequentially illuminated from 390 nm to 680 nm in 10 nm steps with a monochromatic-tunable light source (Polychrome V, TillPhotonics). Images were captured with a monochromatic CCD-camera (AxioCam MRm, Zeiss) while propietary software was used for synchronization (AxioVision, Zeiss).

A PTFE's standard (SG 3201, Zenith Polymer) was usually attached for reference purposes. For data importation, processing and analysis of the information, custom algorithms are being developed under a numerical computing environment (MatLab, Mathworks).

Results

Preliminary results show on one hand the ability to generate NBI-like captures with enhanced sensibility for vascular structures plus on the other one the ability to automatically identify calibration standards and specular reflections under inhomogeneous capture conditions. Currently, we are iterating on

preprocessing algorithms of the raw data, to switch to a more consistent spatial-reflectance
space. As some technical challenges have appear on the way. Already achieved goals include extracting raw data from a closed proprietary file system into MatLab (instead of rescaled exported files), spatial and spectral denoising, image registration for improved spatial correlation and detection of specular reflections and PTFE's patch. Upcoming work will include the implementation of a classification tree for supervised learning of relevant spatial-spectral texture signatures.

Conclusions

Machine learning techniques are revolutionizing our way to analyze huge amounts of data, uncovering hidden patterns behind it. That makes them specially suitable for big-data-volume problems such as analysis of endoscopic hyperspectral imagery. However, comparability still remains a challenge on its own.

References

[1] Parkin, DM et al. (2002). CA: a cancer journal for clinicians, vol. 55, pp. 74–108.

[2] Gerstner, A et al. (2012). Journal of Biophotonics, vol. 5, pp. 255–262.

Effect of melatonin and its analogues: agomelatine, IIK7 and 5MCA-NAT in the tear secretion.

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Introduction

Melatonin production has been discovered in some eye areas [1] and recently has been found in human tears [2] The study has investigated the isolated action of melatonin and its analogues, agomelatine, IIK7 and 5MCA-NAT (10 µl at 100 µM) on the tear secretion applied topically in cornea rabbits, and its relationship with the MT1, MT2 and MT3 / QR2 receptors [3].

Method

Tear secretion was measured as the length (mm) of the Schirmer test for 5 min. according to the protocol described by Van Bjisterveld. Control experiments were performed by applying 10 µl of saline solution (NaCl 0.9 %) containing 1% DMSO instilled 15 minutes before any of the other compounds were used. Melatonin and its agonists were instilled in a volume of 10 µl at 100 µM.

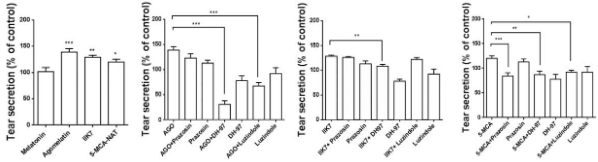
Tear secretion measurements were performed at 5, 15, 60 and 120 minutes after their application (n=24). Melatonin receptor antagonists, DH97 (a MT2 selective antagonist), prazosin (MT3 /QR2 inhibitor) and luzindole (a non-selective melatonin receptor antagonist), were applied at 100µM (10µl) and instilled 15 minutes before the application of the agonists which were instilled at 100 µM (n=10).

To determine the concentration-response curves, different concentrations of melatonin, agomelatine, IIK7 and 5-MCA-NAT were tested according to the previous methodology. Concentrations tested varied from 1µM-1mM (n= 10).

Statistical analysis was performed using the software SSPS Statistic 23 (IBM, Chicago; USA). All data are presented as the mean ± S.E.M.

The normal distribution of all variable for each experiment was assessed with Saphiro-Wilks test. Statistical differences between baseline and post-instillation for all treatments were calculated using Student t-test for related samples. In addition, One Way ANOVA test for related samples was used to analyses the trend in dose-response experiments.

Results:



Conclusion

The study shows that the agomelatine, IIK7 and 5MCA-NAT act as secretagogues of tear secretion, acting through the receptors MTr in different pathways, not so melatonin, therefor they could be considered excellent therapeutic candidates for dry eye treatment.

References

[1]Alarma-Estrany P and Pintor J (2007) Melatonin receptors in the eye: location, second messengers and role in ocular physiology. Pharmacol Ther 113:507-522. [2] Carracedo G, Carpena C, Concepcion P, Diaz V, Garcia-Garcia M, Jemni N, Lledo VE, Martin M, Pastrana C, Pelissier R, Veselinova A, Wang X and Pintor J (2017) Presence of melatonin in human tears. J Optom 10:3-4.

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Optical and Visual quality with multifocal contact lenses

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Introduction

Soft bifocal CLs have shown to be effective in slowing myopia progression [1]. Multifocal CLs work by decreasing accommodative effort, and therefore foveal myopic blur [1]. The goal of this study is to use an Adaptive Optics Visual Simulator to evaluate the effect of multifocal contact lenses on aberrations and visual performance with different pupil sizes.

Methods

Measurements were performed in a custom-made AO system. Three multifocal designs (1Day moist-Center near) of low (+1.25D), medium (+1.75D) and high (+2.50D) additions were selected. The experiment was split into 2 sessions; the experiment generally includes measurement of aberrations, visual acuity and perceptual scoring. Session 1 which was performed with paralyzed accommodation were visual acuity was tested for three different pupil sizes (3, 4 & 5mm), scoring was done for 5mm pupil in the system. The same set of experiments were performed in session 2 with natural accommodation where the pupil size was not controlled.

Results

So far, three subjects have been measured in the study for both Session 1(paralyzed accommodation) and Session 2(natural accommodation).

ABERRATIONS

As concerned with aberrations, we are more interested in the spherical aberrations. The center near designs are known to induce negative spherical aberrations in the eye. According to the results except for one subject the other two subject's shows negative spherical aberration.

VISUAL ACUITY

For visual acuity, as the pupil size decreases we would expect more of a monofocal behavior since the subject has access to only one zone of the lens. As the pupil size increases we would expect a bifocal performance with one peak for far and one for near. This trend is more or less followed in Lens B (+1.75D) in all the subjects. There are few variability with Lens A (+1.25D) and

Lens C (+2.50D). But when we observe the overall visual acuity even though we are using a center near design the visual acuity for far is not much reduced with the lenses compared to the no lens (monofocal) condition, Lens B(+1.75D) seem to have a better performance compared to the other two lenses.

Perceptual Scoring

For scoring three distances were tested – far (0D), intermediate (+1.75D) and near (+2.50D). The subjects were asked to score a set of natural images from 0-5. We noticed that there is a better performance in intermediate distance with all the three lenses in the three subjects. Theoretically, we would expect a better performance with Lens C (+2.50D) for near and Lens B (+1.75D) for intermediate distances.

Conclusions

There are few inter-subject variability in the performance of the subjects with different lenses and different conditions. We would get a better understanding with more subjects of different age groups. Currently we are including more subjects in both sessions to understand.

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Development of an LSPR-based sensor for the detection of acanthamoeba

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Introduction

Genus Acanthamoeba is distributed in the environment and has been isolated from the air, soil, water, contact lenses, air conditioning units, clinical samples, among many other habitats. Patients with acanthamoeba keratitis may experience pain with photophobia, epithelial defect, and edema but, if it is not treated properly and aggressively, it can cause complete loss of vision. That is the reason early diagnosis is so important. On the other hand, nanoparticles for biomedical applications has increased due to their good properties.(1) The main objective of this project is the development of a detection method of acanthamoeba using gold nanoparticles.

Methods

Different chemical protocols were performed to get the union of two Acanthamoeba DNA sequences with the AuNPs (functionalization). The functionalization is checked by spectrometry as well as dynamic light scattering (DLS).

After the union of the target (hybridization) we can observe a change of colour in our solution due to the aggregation that occurs between the AuNPs.

Results

A change of colour in our system when we add acanthamoeba is observed. This is a good indicator of the presence of the pathogen.

Conclusion

AuNPs offer a colorimetric detection method of the presence of Acanthamoeba. The development of this project is useful both medical detection and also the patients can use the device.

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"Visual function in patients with keratoconus before and after implantation of intrastromal rings"

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Introduction

Keratoconus is a progressive deformation of the cornea of different etiology and evolution according to social groups and races. Classical histopathological features include stromal thinning, deposits of iron in the basal epithelial membrane, and breaks in the Bowman's Membrane. Keratoconus usually presents as an isolated disorder, although several reports describe an association with congenital syndromes [1]

Implantation of intrastromal corneal ring segments (ICRS) in Keratoconic eyes has been shown to flatten the cone and reinforce the cornea, which reduces astigmatism and corneal high order aberration (HOA) Keraring® (Mediphacos, Brazil) ICRS have a triangular cross-section and flat posterior surfaces that induce a prismatic effect on the cornea to reduce glare; however, patients frequently report the presence of nighttime visual disturbances after implantation. The ICRS, implanted at present, of 6 mm around the pupillary orifice from the visual axis, produces a less central overlap of the mesopic pupil than other ICRS and, in theory, produces less distortion especially in the mesopic visual function. [2]

Methods

The sample comprised 50 patients who had been implanted with Keraring ICRS with an optic zone of 6 mm using a manual technique.

One week before surgery and after at least one month, and later between 6 months and a year after surgery, all patients had an ophthalmic examination that included mesopic and scotopic refraction, with instruments and a specially equipped room for it in the same hospital and also Aberrometric analysis and study of the corneal structure, using a KR1-W® (Topcon, Japan).

Keratometry, asphericity, and pachymetry were measured using a Scheimpflug camera Pentacam® (Oculus, Germany). Keratometry values were recorded in diopters (D) for the central 3.0 mm zone (KM-3) and the central 5.0 mm zone (KM-5). Also, asphericity was calculated at a 4.5 mm diameter corneal area and a 6.0 mm diameter corneal area. Pachymetry (µm) was measured at the thinnest point.

Results

Still we have not completely analized the results of the study, the one year measures, in some patients hasn't been finished yet. We calculate that for the dates of PhDAY-FOO 2019 there are the finished measures and we can bring out conclusions from the results.

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Light, yellow filter and darkness effects on PIO and melatonin.

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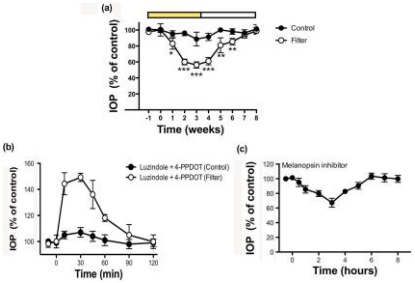
Introduction

Melatonin is a neurohormone mainly synthesized in the pineal gland; however, it is also present in the aqueous humor. One of melatonins' functions in the eye is the regulation of intraocular pressure (IOP). Melatonin is known to be sensitive to light. Recently, the photopigment which controls melatonin synthesis, melanopsin, was found in the crystalline lens. Therefore, light conditions are an interesting possible way of regulating melatonin levels in the aqueous humor. The current study used yellow filters, since melanopsin is activated by short wavelength (blue light).

Method

New Zealand white rabbits were used, divided in two groups, one under controlled 12 h light/dark cycles, while the rest had their cages encased with a yellow filter (λ 465–480). IOP measurements were taken every week at the same time before they were anesthetized for aqueous humor extraction.

Results



Keeping the rabbits under the yellow filter resulted in a decrease in IOP up to 43.8 ± 7.8% after 3 weeks. This effect was reversed after the topical application of selective and nonselective melatonin receptors antagonists, 4PPDOT and luzindole. Also, blocking melanopsin by its antagonist AA92593 under white light condition decreased IOP. Finally, melatonin levels were found significantly higher in the aqueous humor of rabbits developed under yellow filter compared to controls (37.4 ± 4.2 and 15.3 ± 3.1 ng/ml, respectively).

Conclusions

Yellow filters modulate melatonin levels in the aqueous humor due to deactivating melanopsin activity. This effect leads to a decrease in IOP mediated by melatonin receptors.

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PÓSTERES

Ocular Surface condition in pediatric patients.

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Introduction

Dry eye disease (DED) has a high prevalence around the world that increases with age and female gender. Although extended research exists about DED, children ocular surface condition has not been investigated as extensively as in adults. The multifactorial nature of DED causes tear film instability, inflammation and potential damage on the ocular surface1. There is a wide variety of symptoms like ocular discomfort, itching eyes and visual disturbance. Environmental factors as air pollution and the intensive use of video displays terminals can exacerbate DED. Children are also exposed to these factors and may complain of fewer DED symptoms than adults2. Our study aim is to characterize ocular surface condition and symptomatology in a population of healthy pediatric patients.

Method

Children from 7 to 17 years, non-contact lens users and without ocular pathologies or allergies have been studied. The protocol includes measurements of the low tear meniscus height (LTMH) made by optical coherence tomography (OCT) Spectralis, non-invasive break-up time (NIBUT) by Keratograph 5M, ocular scattering index (OSI) through a double pass system and fluorescein staining among others. Children completed the OSDI questionnaire and some questions about the time of use of digital screens.

Results

As preliminary results, 80 eyes from 80 patients have been measured. The mean age was 11,49± 3,11 years (42 boys and 38 girls). Average LTMH for OCT was 218,53 ± 75,42µ, mean NIBUT 15,36 ± 8,61s, OSI 0,54± 0,41 and OSDI questionnaire 7,84± 6,13.

A new group of healthy adults have been included as a control group in the study to compare both groups. The collected data will be analyzed statistically to assess the state of the ocular surface in children.

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The Effect of Wearing Two Different Designs of Soft Contact Lenses on Myopia Control: 2 Years Follow up

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Objective

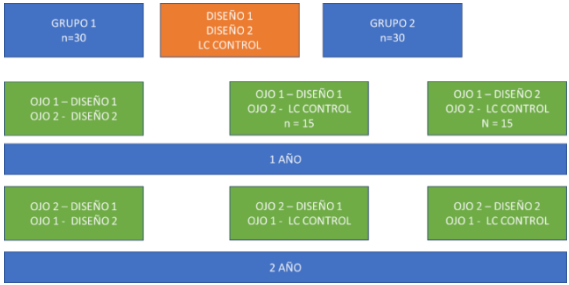
The main objective of this study is to evaluate and compare the effect of two different designs of soft contact lenses (CL) on myopia control.

The secondary objective is to study wether the two CL designs are safe to use compared with a standard CL design.

Material and methods

The study will include three groups, each of which will be assigned to wear a specific design of CL as shown below:

1. First CL design: Contact lens with far center and annular addition.
2. Second CL design: Contact lens with far center (with minimum central zone for fence) and annular addition.
3. Standard CL design: Contact lens with monofocal standard design.



Sixty participants between 7 and 15 years old will be recruited from the university clinic and from the public hospitals of the community of Madrid (collaboration with ophthalmologists).

The Topographical Effect of Optical Zone Diameter in Orthokeratology Contact Lenses in High Myopes.

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Purpose
To evaluate the effect of the optical zone diameter (OZ) in orthokeratology contact lenses regarding the topographical profile in patients with high myopia (-4.00 D to -7.00 D) and to study its effect over the visual quality.
Materials and methods
Twelve patients (18 eyes) were fitted with overnight orthokeratology (OrthoK) with a randomized 6 mm or 5 mm OZ lens worn for 2 weeks, followed by a 2-week washout period, between both designs. Keratometry (K) readings, optical zone treatment diameter (OZT), peripheral ring width (PRW), higher-order aberrations (HOA), high (HC) and low contrast (LC) visual acuity, and subjective vision and comfort were measured at baseline and after 2 weeks of OrthoK lens wear of each contact lens.
Results
No significant differences were found between any measurements for the same subject at both baselines (p value > 0.05). There was no difference between OZ lens designs found in refraction, subjective vision or comfort, and HC and LC visual acuity. Contrast sensitivity was decreased in the 5 mm OZ lens design compared with 6 mm OZ design (p-value < 0.05). 5 mm OZ design provoked a greater flattening, more powerful midperipheral ring and 4th-order corneal and total spherical aberration than the 6 mm OZ design, being statistically significant after 7 days, for corneal aberration, and 15 days, for corneal and total, of wearing the lens (p-value < 0.05). The OZT obtained were 2.8 ± 0.2 mm and 3.1 ± 0.1 mm for 5 mm and 6 mm OZ design, respectively (p-value < 0.05). Regarding PRW, the 5 mm OZ design had a wider ring width in both the nasal and temporal zones (p-value < 0.05).
Conclusions
A smaller diameter optical zone (5 mm) in orthokeratology lenses produces a smaller treatment area and a larger and more powerful midperipheral ring, increasing the 4th-order spherical aberration that affects only the contrast sensitivity but without differences in visual acuity and subjective vision compared with a larger OZ diameter (6 mm).

Corneal curvature and aberration changes after scleral lens wear in keratoconus patients

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Introduction

Scleral contact lens efficacy in visual rehabilitation is well known, but it is also important to understand their effect on the ocular surface such as anterior and posterior corneal curvature changes and aberrations after scleral lens wear. (Serramito-Blanco et al., 2018; Serramito et al., 2018) With scleral lens wear, corneal curvature changes have been reported in healthy patients and in keratoconus patients. But, previous studies have not specifically quantified the corneal changes in keratoconus patients and patients with intrastromal corneal ring segments (ICRS) implanted with scleral lens wear. The aim of the study was to investigate the changes in anterior and posterior corneal curvature and aberrometric parameters across the corneal surface before scleral contact lens wear and immediately after eight hours of wearing scleral contact lens in keratoconus subjects with and ICRS.

Methods

Twenty-six subjects diagnosed with keratoconus were selected to participate in the study. The mean age of subjects was 36.95±8.95 years. Subjects were divided into two groups, those with Intra-Corneal Ring Segments (KC-ICRS group) and those without ICRS (KC group). Subjects were instructed to wear 16.5 mm scleral lenses for eight hours. Topographic and aberrometric parameters were evaluated before lens wear and immediately after lens removal. Corneal thickness evaluated in different quadrants, anterior and posterior corneal curvature were evaluated at corneal diameters of 2, 4, 6 and 8 mm and corneal aberrations were measured at 4, 6 and 8 mm pupil diameters.

Results

There was a statistically significant corneal thinning ($p<0.05$) in the inferior region of the KC group and in the superior region of the ICRS group. No change ($p>0.05$) in the anterior chamber depth was found. Regardin anterior cornea, in KC group, there was a statistically significant flattening of the central corneal curvature, from 6.98 mm to 7.09 mm ($p<0.05$). No changes were found in the central corneal curvature in the KC-ICRS group. The KC group showed anterior

corneal curvature flattening, mainly in the nasal quadrant. The KC-ICRS group showed flattening primarily in the inferior hemisphere. In the KC group, spherical aberration for 6-mm pupil increased significantly. In the KC-ICRS group, changes in aberrations were significant for High Order RMS at 4 mm and 6 mm pupil diameters ($p<0.05$), for oblique astigmatism for 4 mm and 6 mm, and for vertical coma for 4 mm pupil ($p<0.05$). For posterior cornel, the KC group showed a steepening ($p<0.05$) in the temporal quadrant and a flattening that mainly affected to the superior-nasal quadrant. The ICRS group showed a steepening ($p<0.05$) that mainly affected to the superior-nasal quadrant. Regarding posterior corneal aberrations, only changes ($p<0.05$) in Z4 for 8 mm and Z8 for 4 mm were found in the KC group.

Conclusions

Short-term scleral lens wear showed a thinning of the cornea and flattening of the anterior corneal surface in all subjects. In the KC group, the flattening was more pronounced in the nasal quadrant while changes were more pronounced inferiorly in KC-ICRS group. Moreover, changes in the posterior corneal curvature affects different regions in keratoconus patients with and without ICRS.

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CISS vs CISSVE comparison

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Introduction
CISS (Convergence Insufficiency symptom survey) is the most accepted survey to detect and measure close vision problems.
Recently, our team has been working on the adaptation to Spanish of CISS and its validation, in order to provide a reliable tool to measure these symptoms to Spanish speaker professionals. As an outcome, CISSVE (Spanish version of CISS)
The current work compares the Spanish version ($CISS_{VE}$) with the original version (CISS) and analyse the results to assess the reliability of the tool.

Methods
Analysis of psychometric properties of the Spanish version of CISS through Rasch analysis [1] supported by the software Winsteps. Clinic checks to get validation through field tests [2] Comparison between $CISS_{VE}$ and CISS reliability supported by survey comparison using Winsteps (Rash measurement tool) and SPSS (Stats)

Results
$CISS_{VE}$ is a valid tool suitable for Spanish populations to measure IC problems
$CISS_{VE}$ and CISS behave very similar on reliability according to the Rasch analysis results and other statistical outcomes

Conclusions
An Spanish version of CISS can help professionals on the early detection of IC and other close vision symptoms
The reliability of $CISS_{VE}$, is very similar to CISS, so can be considered a trusted adapted and validated tool

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Assessment of Meibomian Gland Dropout Through Two Types of Meibography Images

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Introduction

There are alterations of the ocular surface related to the meibomian glands such as those causing evaporative dry eye due to Meibomian Gland Dysfunction (MGD) and blepharitis.

In order to evaluate meibomian glands, specialized image techniques are used. This method, referred to as meibography allows the evaluation and quantification of the meibomian gland structure and the possibility of making a computational analysis of the images (1).

We have developed a custom built, non-contact meibographer that uses a white light source combined with a band pass network filter to produce the images. Although we have used several filters, all of them with peak wavelengths corresponding to the network-end of the visible spectrum, we have chosen the filter in 610 nm as the most indicated for the evaluation of Meibomian glands based on the values of the in -gland and inter-gland contrast.

Method:

The present work constitutes a prospective two-visit pilot study. Thirty-six patients were enrolled in the study and the sample was divided into two different groups: 19 control participants and 17 subjects with any pathology related to the MG.

We obtained the meibography images with the OCULUS Keratograph 5M (OCULUS, Wetzlar, Germany), which operates at 840 nm, and afterwards we took the meibographies with the white light non-contact meibographer and the band pass red selected filter of 610nm were taken.

The white light non-contact meibographer consists of a lighting system collimated by a source of halogen light, and an optical fiber at the end of which the red filter is placed before the light falls onto the eye.
The Meibomian gland images are obtained by a CCD camera iNET-GmbH model NS1130BU coupled to a PENTAX 2514-M objective with a focal of 25 mm and an opening F/1.4 connected to a Personal Computer with the software iControl program 2.0.1.7 where the images are displayed in gray scale. The light source and the CCD camera are coupled to a positioning system that permits capturing images from both eyes and both eyelids.
After obtaining the images, they were graded by a single masking person, who did not participate in taking measurements. Meibographies were graded following the scale proposed by Pult & Riede-Pult (2).

Result

A comparison was made between both meibographers to find out if there were significant differences between the meiboscore obtained with each instrument. Results show that there are no statistically significant differences (p-value > 0.05) between the two meibographers when grading the images.

Conclusions

It can be concluded that it is possible to observe and analyse Meibomian glands without the necessity of IR light, being the use of filters of wavelengths within the visible spectrum perfectly viable for meibography. This suggest that it can be transferred to clinic for the assessment of the morphology of the Meibomian glands by the visual health professional.

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Assessment of contrast percepcion in mesopic conduction

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Introduction

In mesopic lighting conditions, or under adverse environmental circumstances such as rain or fog, visual information is reduced. Contour discrimination is worse and there is a substantial loss of color perception. This reduction in visual perception during night driving increases the risk of accidents. This effect could be reduced with a correct evaluation of the visual function parameters. Therefore, it would be necessary to include tests of visual acuity and contrast sensitivity during night driving for getting and renewing the driving license.

Objective and Method

The main objective is to find a photopic predictor of the mesopic visual function. For this aim, the correlation between mesopic visual acuity and photopic visual acuity evaluated with variable contrast optotype test has been studied. Also, the correlation between mesopic contrast sensitivity and photopic contrast sensitivity with filters of different optical densities has been analyzed.

The study has been carried out in 56 people, aged between 20 and 71 years, all of them in possession of the Spanish driving license.

Results and Conclusions

We have determined that under photopic lighting conditions, the use of 20% contrast optotypes with an 80% filter makes it possible to assess the mesopic visual acuitiy. On the other hand, the use of filters of 90% and 70% for the evaluation of the contrast sensitivity in photopic conditions allows us to know the visual function capacity of the drivers at night. Thus, both methods could be used as economic and practical predictors of mesopic visual acuity and contrast sensitivity.

Visual implications for school performance

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Introduction

There are several important visual functions related to near work activities, including the ability to focus, the ability to converge, eye movements, eye refraction (nearsightedness, farsightedness, astigmatism) and visual acuity. If there is a poor function, symptoms such as headaches, blurred vision, eye fatigue, double vision and drowsiness may occur [1].

Other types of symptoms related to school performance may also occur, such as low reading speed, loss of reading line, words moving on the page, decreased concentration, or decreased comprehension in close-up activities [2]. These anomalies have an impact on the day-to-day life of students, since near vision activities predominate at school age.

Method

A review of electronic literature was carried out in specialized databases (Medline, Web of Science) to retrieve published studies. Studies relating epidemiology of visual anomalies and the relationship between visual anomalies and school performance were included.

Result

We identified a series of articles in which they point out some visual anomalies and their repercussion on academic performance and symptomatology.

Non-strabismic visual dysfunctions, have a prevalence between 2.25 and 33% [3], depending on the diagnostic criteria used. In addition, studies indicate that children with visual anomalies tend to have reading and writing problems more frequently. This performance depends largely on the visual symptomatology present in the school population.

Conclusions

Taking into account the information consulted, it is important to detect visual problems in the school population, since due to its visual symptomatology it can cause a negative impact on academic performance. There are few studies

that relate to this issue, thus, it is necessary to conduct more specific research on this topic.

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Dry eye and electronic devices

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Introduction

In a few years electronic devices have become part of our daily life, becoming essential in many cases. The visual system of the human being has gone from working in far vision, to do it in close vision with PCs and other electronic devices practically all day.

In this work, which we will expand later, we try to find the habits, symptoms and signs that may arise due to the excessive use of these new technologies.

Method

The method used in this first part of this study has been launch an online survey (www.encuestaonline.com), and the sample of 204 students within the Faculty of Optics and Optometry has been chosen.

The obtained results have been treated by the program that conducts the online survey.

Results

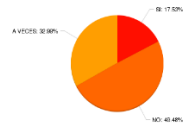
The results obtained were the following:

-Sex: 77.1% women and 22.1% men.

-Age: 71.1% between 20 to 25 years old, 13.2% more than 30 years old, 10.8% less than 20 years old and 4.9% between 26 to 30 years old.

-Hours of use of electronic devices: 2.5% less than 2 hours; 26.8% between 2 and 4 hours; 38.9% between 4 and 6 hours and 31.8% more than 6 hours.

Hours of use of electronic devices



Dry eye feeling

-At least 87.4% use electronic devices before sleep.

-A percentage of 76.4% use ambient light when using electronic devices.

-After the use of electronic devices, a percentage of 11.8% note a grit sensation and of this percentage, 20.5% feel it sometimes; 36.9% note sensitivity to light and 28.2% sometimes; 17.9% note eye pain and 33.8% sometimes; 10.8% note blurred vision and 32.3% sometimes; 17.5% note dry eye and 33% notice it sometimes.

Conclusions

At this preliminary part of the study we can conclude that an elevated number of participants uses electronic devices before sleep and that many of them show symptoms that could be related to dry eye

Myopia boom: risk factors and new tech devices

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Introduction

Myopia has become a public health problem due to increased prevalence, especially in Southeast Asian countries; WHO recognition as the leading cause of visual impairment if not corrected; and the risk of myopia-derived pathologies that cannot be prevented with vision correction [1]. Epidemiological studies have shown a great prevalence in Eastern Asia countries, especially in young people; with prevalence of 86.2% in Singapur or 80% in Taiwan [2].

The use of new electronic devices such as tablets and smartphones is increasing in teenagers. In addition, many schools incorporate these devices in their classrooms. These devices can have an impact on the visual system due to several factors, including shorter working distance, addiction and lower flickering rate. The aim of this review is to compare and update knowledge about the prevalence of myopia and the use of electronic devices.

Method

A systematic review of the literature was performed to evaluate the current evidence on myopia prevalence, its risk factors and the increase of use of electronic devices.

Results

Urban areas, near working distance and high educational requirement have shown an association with myopia increase. Genetics has also an important role in high myopia. On the other hand, outdoor activities has shown to be a protective factor against myopia. This can be explained with the dopamine theory, which is related with a decrease of axial elongation.

Few studies have been done to link electronic devices and myopia. In one of them, a relationship was found between increased computer and smartphone use with lower visual acuity and a higher prevalence of myopia, probably related to a shorter distance of use of these devices and its addictive factor [3].

Conclusions

Prevalence of myopia is nowadays a public health problem, especially in some Asian countries. The mechanisms of risk and protective factors are also unclear, as well as the relationship between smartphones, tablets and myopia. Further research needs to be done to better understand the etiology of myopia.

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Influence of a game battery on reading comprehension and saccadic eye movements in primary students.

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Introduction
Although modern societies tend to evolve towards multimedia digital technologies, reading is still one of the main tasks children have to face during their school years and reading comprehension is vital for academic success. Common sense and science have linked since long ago reading comprehension and saccadic eye movements [1], so optometrists pay special attention to this area whenever confronting low school performance patients. Visual training (VT) is one of the therapeutic approaches to eye motility problems. Some professionals claim it could be an interesting activity to do in school [2]. The goal of this study was to test a battery of games used as vision therapy, specifically chosen to be developed at school.
Method
Prospective interventional case and control study over 50 fourth grade children. The whole sample underwent a vision screening before the study began. Saccadic eye movements were studied with the Developmental Eye Movement (DEM) test, ECL test was used to assess reading comprehension. Measurements took place at the beginning of the school year (T0), end of school year (T1) and after the second term of the following year (T2). Study group (G1) had VT sessions every week for one hour during the first school year. The second year none of the groups got training in order to evaluate the duration of the acquired visual skills.
Results
45 subjects (20 female, 25 male), were divided into study (22 subjects) and control (23 subjects) groups. Mean age (SD) was 8.9 (0.32) years. Horizontal DEM time decreased significantly (from 58.7 to 45.0 seconds) during the 2 year period for both study and control groups. No statistically significant differences were found between groups at any moment. On the other hand, reading comprehension showed a significant improvement in the study group right

after VT treatment was finished (Mann-Whitney U; p=0,036), but not a year later (Mann-Whitney U; p=0,95)

Conclusions

Although some studies [3] have found a correlation between horizontal DEM time and reading comprehension, the present research was not able to show so. A significant improvement was shown in reading comprehension right after VT was finished, but it was not maintained over time. We should seek a better and more profound understanding of the relationships among VT, saccadic eye movements and reading comprehension.

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Evaluation of the anti-inflammatory effect of an ophthalmic tear substitute based on a combination of Aloe vera and Hydroxypropylmethylcellulose.

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Introduction

Aloe vera has been widely introduced in the last decade in the pharmaceutical field for the manufacture of topical products, such as healing ointments and gel formulations. The anti-inflammatory properties of this healing agent have been described in the literature for years. [1] [2] A novel ophthalmic solution with a specific formulation that incorporates an Aloe vera extract has been developed for ocular irritation relief in dry eye patients. The purpose of this work is to evaluate the effect upon ocular surface inflammation of this new tear substitute based on a combination of Aloe vera and Hydroxypropylmethyl-cellulose in dry eye symptomatic patients. [3]

Methods

Twenty symptomatic dry eye patients with ages ranging from 38 to 66 (mean 51,90 ± 8,44) and symptomatology of dry eye disease participated voluntarily in this study. They were recruited considering a cut-off of 13 points in Mcmonnies test. All measurements were performed in both eyes, before instillation and after 1 month and 3 months using the humectant solution. Dry Eye Questionnaire (DEQ), Tear Film Break Up Time (TFBUT), Schirmer test, Matrix metalloproteinase-9 (MMP-9), Interleukin-1β (IL-1β), Interleukin-6 (IL-6) and Tumor Necrosis Factor alpha (TNF-α) concentrations were performed.

Results

No statistically significant differences were detected in Schirmer test results. However we observe an improvement ($p=0.002$) in TFBUT and in dry eye symptomatology after Aloe vera-hydroxypropylmethylcellulose tear substitute instillation. We found a statistically significant decrease in MMP-9 concentration at 1 and 3 months of treatment ($p=0.002$; $p=0.04$ respectively) and in IL-6 concentration after 3 months of treatment ($p=0.003$). We did not found differences on IL-1β concentration between the baseline and after treatment. TNF-α was not detected.

Conclusion

Aloe vera-hydroxypropylmethylcellulose based tear drops produce a decrease on ocular surface pro-inflammatory mediators expression (MMP-9, IL-1β and IL-6) and in dry eye symptomatology related to ocular dryness and irritation, as well as an increase in tear film stability.

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