CJORCO

CANADIAN JOURNAL OF OPTOMETRY | REVUE CANADIENNE D'OPTOMÉTRIE

VOL 74 NO 3 | 2012

Diagnosis and management of a full thickness macular hole

Canadian research contributions to low vision rehabilitation: A quantitative systematic review

One optometrist's personal experience with age-related macular degeneration (AMD) and nutritional supplementation

MOST TRUSTED CANADIAN BRAND*

THANK YOU FOR MAKING ACUVUE® THE Most Trusted Brand*

AMONG CANADIAN EYE CARE PROFESSIONALS

We look forward to continuing to support you in providing your patients with an exceptional vision care experience.

ACUVUE®

BRAND CONTACT LENSES

INNOVATION FOR HEALTHY VISION™

*Most trusted brand of contact lenses by Canadian Optometrists, Opticians and Ophthalmologists. Data on file. Johnson & Johnson Inc. 2011.

ACUVUE® and INNOVATION FOR HEALTHY VISION™ are trademarks of Johnson & Johnson Inc. ©Johnson & Johnson Inc. 2012

Canadian Journal of Optometry
Revue canadienne d'optométrie
Vol 74, No 3
2012
(Date of issue: November 2012)
(Date de parution : novembre 2012)
ISSN 0045-5075

The Canadian Journal of Optometry is the official publication of the Canadian Association of Optometrists (CAO) /
La Revue canadienne d'optométrie est la publication officielle de l'Association canadienne des optométristes (ACO) :
234 Argyle Avenue, Ottawa, ON, K2P 1B9. Phone 613 235-7924 / 888 263-4676, fax 613 235-2025, e-mail info@opto.ca, website www.opto.ca. Publications Mail Registration No. 558206 / Envoi de publication – Enregistrement no. 558206.
The Canadian Journal of Optometry / La Revue canadienne d'optométrie (USPS#0009-364) is published four times per year at CDN$55, and CDN$65 for subsriptions outside of Canada. Address changes should be sent to CAO, 234 Argyle Avenue, Ottawa, ON K2P 1B9.

The CJO*RCO is the official publication of the CAO. However, opinions and commentaries published in the CJO*RCO are not necessarily either the official opinion or policy of CAO unless specifically identified as such. Because legislation varies from province to province, CAO advises optometrists to consult with their provincial licensing authority before following any of the practice management advice offered in CJO*RCO.

The CJO*RCO welcomes new advertisers. In keeping with our goal of advancing awareness, education and professionalism of members of the CAO, any and all advertising may be submitted, prior to its publication, for review by the National Publications Committee of the CAO. CAO reserves the right to accept or reject any advertisement submitted for placement in the CJO*RCO.

La CJO*RCO est la publication officielle de l'ACO. Les avis et les commentaires publiés dans la CJO*RCO ne répresentent toutefois pas nécessairement la position ou la politique officielle de l'ACO, à moins qu'il en soit précisé ainsi. Étant donné que les lois sont différentes d'une province à l'autre, l'ACO conseille aux optométristes de vérifier avec l'organisme provincial compétent qui les habilite avant de se conformer aux conseils de la CJO*RCO sur la gestion de leurs activités.

La CJO*RCO est prête à accueillir de nouveaux annonceurs. Dans l'esprit de l'objectif de la CJO*RCO visant à favoriser la sensibilisation, la formation et le professionnalisme des membres de l'ACO, on pourra soumettre tout matériel publicitaire avant publication pour examen par le Comité national des publications de l'ACO. L'ACO se réserve le droit d'accepter ou de refuser toute publicité dont on a demandé l'insertion dans la CJO*RCO.

Editor in Chief / l'éditeur en chef :
Dr B. Ralph Chou

Chair, National Publications Committee / Président, Comité national des publications : Dr Paul Geneau

Academic Editors / Rédacteurs académiques :
University of Waterloo, Dr B. Ralph Chou
Université de Montréal, Dr Claude Giasson

Managing Editor / Rédactrice administrative ;
Advertising Coordinator / Coordonnatrice des publicités :
Graphic Design / Conception graphique
Leslie Laskarin

Copy-editors:
Tony Gibbs, Jenn Hood

Printing Consultant / Impression : Vurtur Communications

Translation / Traduction:
Tessier Translations / Les Traductions Tessier

Translation Editor / Réviseure des traductions :
Claudette Gagnon

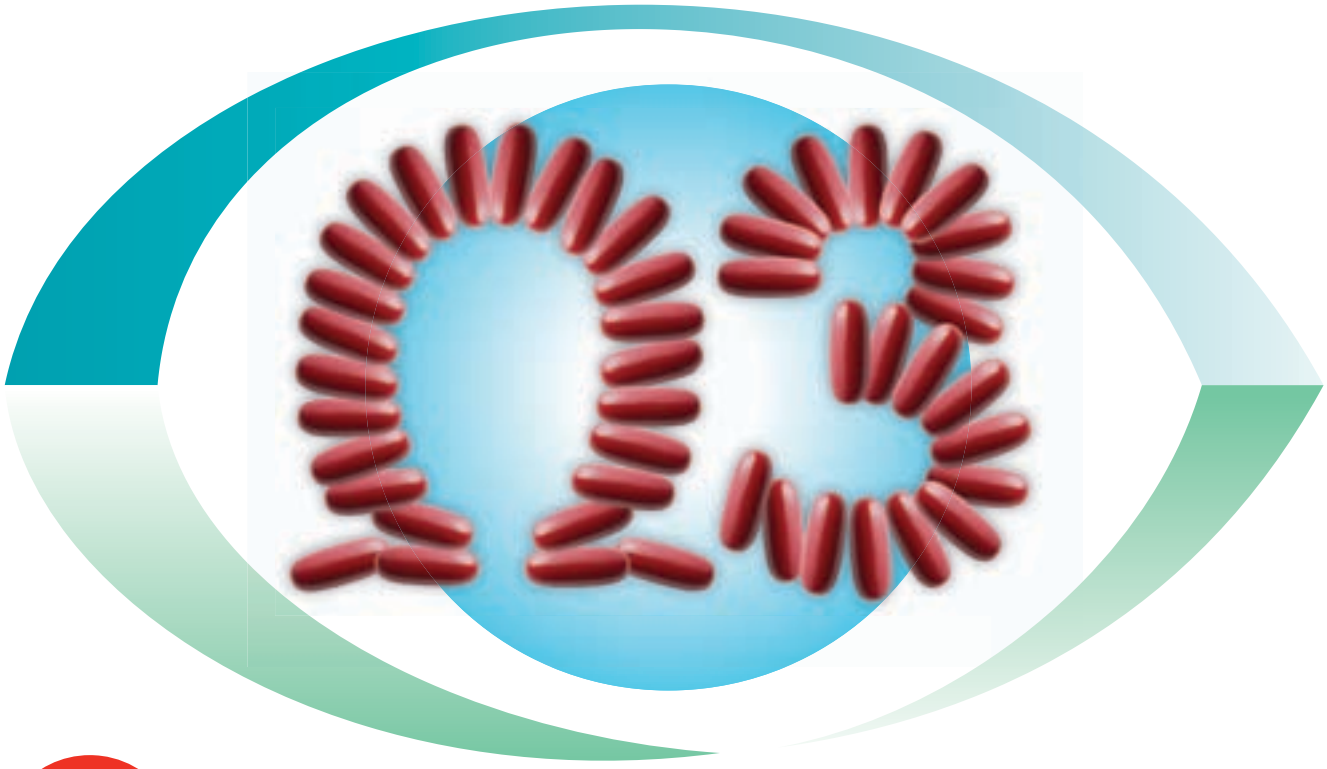
CJO|RCO
CANADIAN JOURNAL OF OPTOMETRY REVUE CANADIENNE D' OPTOMÉTRIE

Uniform requirements for manuscripts: login to the member site at **opto.ca** or contact CAO.

Exigences uniformes pour les manuscrits: voir sur le site des membres à **opto.ca** ou contacter l'ACO.

MIX
Paper from responsible sources
Papier issu de sources responsables
FSC® C100205
FSC www.fsc.org

New Advancements in Nutrition for **Eye Health.**



NEW!

For Adults With AMD

PreserVision®
Eye Vitamin and
Mineral Supplement
AREDS 2* formula

With **1000 mg** of **Omega-3**

Omega-3

For Adults Over 50

Ocuvite®
Adult 50+
Eye Vitamin and Mineral
Supplement

BAUSCH + LOMB

The Global Leader in Ocular Vitamins.†

Bausch & Lomb Canada Inc., Vaughan, Ontario, L4K 4B4
©Bausch & Lomb Incorporated
PreserVision and Ocuvite are trademarks of Bausch & Lomb Incorporated or its affiliates.
® AREDS2 is a registered trademark of the United States Department of Health and Human Services.
*AREDS2® is an ongoing study.
†Euromonitor, Global Dollar Sales, Eye Health Supplements, 2010

BY / PAR DR. LIL LINTON, OD

During my first year as President, CAO, I attended every provincial Annual General Meeting (AGM) to report on behalf of CAO and interact with provincial leaders and the membership. It was a wonderful opportunity to see old friends and to meet many of my colleagues.

Over the years I have observed significant changes. The format for AGMs has been reshaped in many of the provinces. Rarely, are they stand alone events as was the norm in earlier years. Instead, AGMs are incorporated into CE programs and trade shows. The business meetings are also much shorter, with some conducted over lunch.

The change is in part due to the way provincial associations are governed, with greater authority given to provincial councils and boards. Membership approval is not required in the same way as it was in the past.

Another factor is the ability to communicate electronically with our members throughout the year, keeping them apprised about activities and developments. There is less of a need for detailed reports at an AGM.

The changing demographic of our membership is also a consideration. There is a difference in interests and what appeals to a member. An AGM program based on a traditional approach simply won't attract a good proportion of members.

In some respects, I regret the move away from an AGM that empowered the members and allowed all to roll up their sleeves for a day or two each year. This collective approach had some benefits including the sense of optometric family that prevailed.

Ultimately, the issue is not whether an AGM is one hour or two days long. The goal is that we have ongoing communication and engage members at all times.Members need to know that their input is important and considered. The annual meeting complements the ongoing process and brings focus to the important work at a provincial and national level. Member participation at all levels is critical. It is important that members attend AGMs, regardless of the format.

Social considerations can be addressed in other ways, including electronic means, volunteer work, CE programs and more. The CAO Biennial Congress is a great opportunity to mix new and old approaches. The Congress program includes a CAO business meeting, but it is also an opportunity for top notch continuing education and personal interaction with your classmates, other colleagues and your family members.

I look forward to seeing CAO members at provincial Annual General Meetings during my second year as CAO President and at the CAO Congress in Edmonton, AB, July 10-13, 2013.

Au cours de ma première année à la présidence de l'ACO, j'ai assisté à toutes les assemblées générales annuelles (AGA) des provinces pour y faire rapport au nom de l'ACO et échanger avec les dirigeants des associations et les membres des provinces. Ce fut une merveilleuse occasion de revoir de vieux amis et de rencontrer beaucoup de mes nouveaux collègues.

J'ai observé des changements importants au fil des ans. Le format des AGA a changé dans beaucoup de provinces. Il est rare que ces événements se déroulent seuls comme c'était l'habitude auparavant. Les AGA sont plutôt intégrées à des programmes de FC et à des salons commerciaux. Les séances de travail sont aussi beaucoup plus brèves et certaines se déroulent au cours du déjeuner.

Le changement est attribuable en partie à la façon dont les associations provinciales sont dirigées : on accorde davantage d'autorité aux conseils provinciaux et aux conseils d'administration. L'approbation des membres n'est pas requise de la même façon qu'elle l'était dans le passé.

Il y a un autre facteur, soit la capacité de communiquer électroniquement avec nos membres tout au long de l'année, ce qui les tient au courant des activités et de l'évolution de la situation. Il est moins nécessaire de présenter des rapports détaillés au cours d'une AGA.

Il faut tenir compte aussi de l'évolution des caractéristiques démographiques de nos membres. Il y a divergence d'intérêts sur ce qui attire un membre en particulier. Un programme d'AGA basé sur l'approche traditionnelle n'attirera tout simplement pas beaucoup de membres.

À certains égards, je regrette l'abandon de l'AGA qui habilitait les membres et leur permettait à tous de se retrousser les manches pendant une journée ou deux par année. Cette démarche collective offrait certains avantages, y compris l'esprit de famille qui prévalait en optométrie.

Finalement, la question, ce n'est pas de savoir si une AGA dure une heure ou deux jours. L'objectif, c'est de communiquer continuellement avec les membres et de les faire participer en tout temps. Les membres ont besoin de savoir que leur contribution est importante et qu›elle compte. L'assemblée générale annuelle complète le processus courant et concentre l'attention sur le travail important effectué à un niveau provincial et national. La participation des membres à tous les niveaux est cruciale. Il importe que les membres assistent aux AGA, quel qu'en soit le format.

Il est possible d'aborder des considérations sociales par d'autres moyens, notamment les moyens électroniques, le bénévolat, les programmes de FC. Le Congrès biennal de l'ACO est une excellente occasion de marier les deux démarches, la nouvelle et l'ancienne. Le programme du congrès inclut une assemblée d'affaires de l'ACO, mais c'est aussi une occasion de formation continue de première qualité et d'échanger personnellement avec vos confrères de classe, d'autres collègues et les membres de votre famille.

J'ai hâte de rencontrer les membres de l'ACO aux assemblées générales annuelles provinciales au cours de ma deuxième année à la présidence de l'ACO, ainsi qu'au Congrès de l'ACO qui aura lieu à Edmonton AB, du 10 au 13 juillet 2013.

Peer Reviewers – A Brief Appreciation
Évaluateurs – un court message de remerciements

The Canadian Journal of Optometry (CJO), like most publications in the basic and clinical sciences, relies on the process of peer review to determine whether scientific article submissions are acceptable for publication. Peer review has come under a great deal of scrutiny recently, due to a number of scandals concerning papers published in prestigious journals that have been retracted due to falsification of data, ethical lapses and other problems.

Editors have the task of selecting individual scientists and/or clinicians whom they believe are sufficiently knowledgeable and experienced in the subject area to assess the hypothesis, methodology, data and analysis presented in a manuscript. Critical comments to improve the clarity of the writing are also requested. The review cycle for this process usually takes around four weeks, although a long or complex work may require more time. To ensure that the review process is unbiased, at least two independent reviewers are assigned, the author's identity is masked from the reviewers, and the reviewers' reports are similarly made anonymous before being sent to the author.

Ideally, this process ensures that the final published work is a clear presentation that is scientifically valid and for the purposes of the CJO, clinically relevant to you, the reader. The CJO editorial team is grateful to the following, who have given freely of their time and talents to review the scientific papers published in the CJO over the past three years.

La Revue canadienne d'optométrie (RCO), comme la plupart des publications des sciences fondamentales et cliniques, s'appuie sur le processus d'examen par les pairs afin de déterminer si les articles scientifiques soumis sont acceptables aux fins de publication. L'examen par les pairs a été récemment scruté à la loupe, en raison d'un certain nombre de scandales concernant des articles publiés dans des revues prestigieuses que les rédacteurs ont dû par la suite, désavouer à cause de falsification de données, manquements à l'éthique et autres raisons.

Les rédacteurs ont la tâche de sélectionner des scientifiques et des cliniciens, suffisamment compétents et expérimentés afin d'évaluer les hypothèses, la méthodologie, les données et les analyses présentées dans un manuscrit. De plus, leurs commentaires et critiques afin d'améliorer la clarté de l'écriture ou de la présentation sont toujours les bienvenus. Le cycle de révision prend habituellement environ quatre semaines, bien qu'un travail plus complexe puisse nécessiter plus de temps. Afin de s'assurer que le processus d'examen n'est pas biaisé, il est souhaitable d'impliquer au moins deux évaluateurs indépendants et de masquer non seulement l'identité de l'auteur à ces évaluateurs, mais aussi celle des évaluateurs à l'auteur.

Idéalement, ce processus garantit que le travail final publié est une présentation claire, scientifique et cliniquement pertinente pour vous, lecteur. L'équipe de la rédaction de la RCO est reconnaissante aux experts suivants, qui ont généreusement donné de leur temps afin d'examiner les articles scientifiques publiés dans la RCO au cours des trois dernières années.

Shelly L. Hook, OD
Barbara E. Robinson, OD, PhD
Timothy H. Tsang, OD
Etty Bitton, OD, MSc
Daniel Brazeau, OD
Léo Breton, OD
Danielle de Guise, OD, MSc
Vasile Diaconu, PhD
Jean-Sébastien Dufour, OD, MSc
Nicolas Fontaine, OD, MSc
Pierre Forcier, OD, MSc
Jacques Gresset, OD, PhD
Jean-Marie Hanssens, OD, MSc
Julie Laurin, OD
Olga Overbury, PhD
Judith Renaud, OD, MSc
Yvon Rhéaume, OD
Patrick Simard, OD, MSc
Benoît Tousignant, OD, MSc
Marie-Chantal Wanet, PhD

Thank you to all of our reviewers!
Merci à tous nos évaluateurs!

– B. Ralph Chou
– Claude Giasson

Dr. Ralph Chou takes role as the Canadian Journal of Optometry's Editor-in-Chief / Le Dr. Ralph Chou devient l'éditeur en chef pour le Journal canadien de l'optométrie

The staff and Council of the Canadian Association of Optometry would like to warmly welcome **Dr. Ralph Chou** to the new role of Editor-in Chief of the Canadian Journal of Optometry.

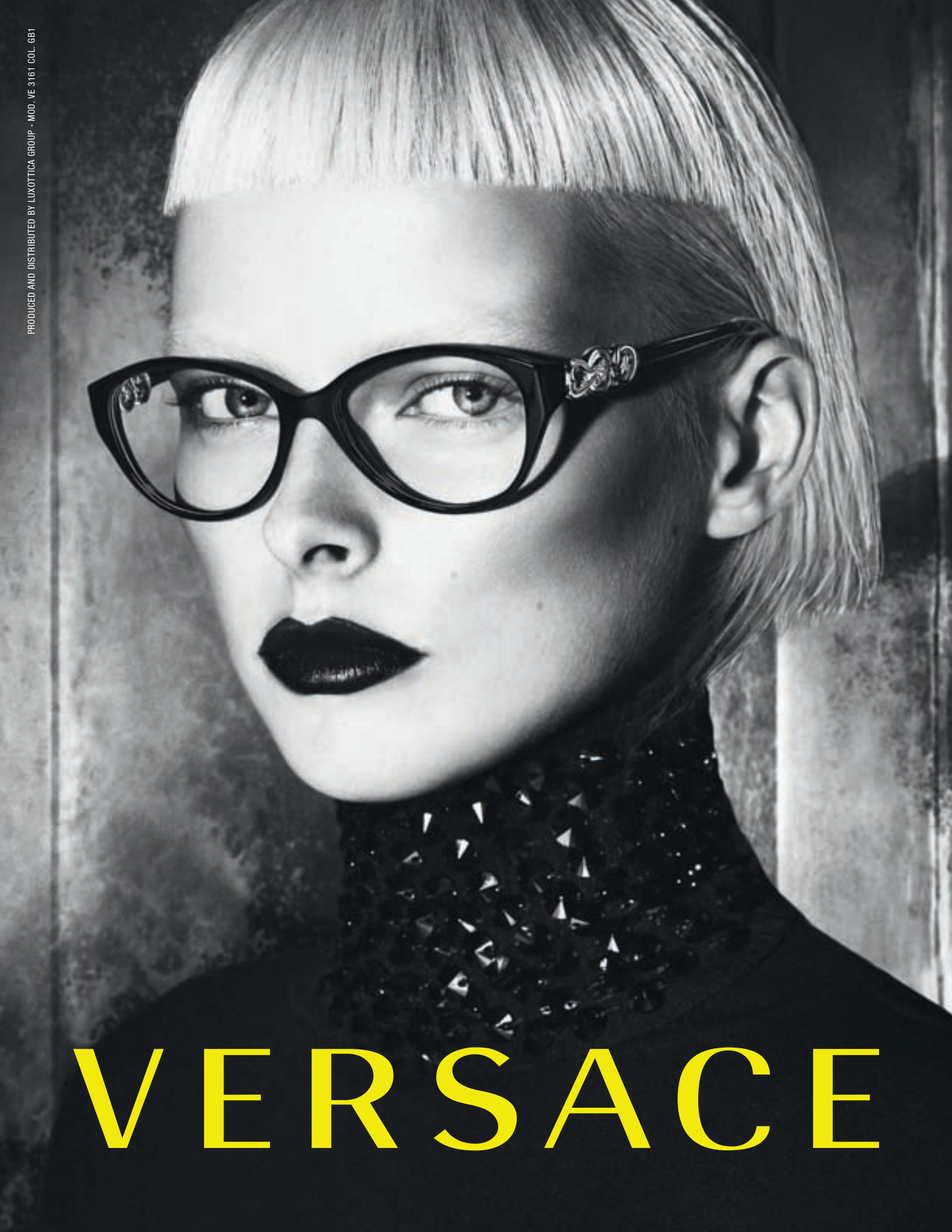
For many years both Dr. Chou, School of Optometry and Vision Science, University of Waterloo and **Dr. Claude Giasson,** École d'optométrie, Université de Montréal have served as academic editors, advising and coordinating to ensure that the academic papers meet requirements for publication.

We are greatly indebted to both Dr. Chou and Dr. Giasson for their valuable contribution.

Le personnel et le Conseil de l'Association canadienne des optométristes aimeraient souhaiter une chaleureuse bienvenue au Dr. Ralph Chou pour son nouveau rôle comme éditeur en chef du Journal canadien de l'optométrie.

Pendant plusieurs années, les Drs. Chou, École d'optométrie et Science de la vision, Université de Waterloo et Claude Giasson, École d'optométrie, Université de Montréal, ont été éditeurs académiques. Ils coordonnaient et conseillaient l'ACO pour assurer que les documents académiques étaient conformes aux normes de publication.

Nous sommes extrêmement reconnaissants aux deux éditeurs pour leur précieuse contribution.


PRODUCED AND DISTRIBUTED BY LUXOTTICA GROUP - MOD. VE 3161 COL. GB1
VERSACE

Proposed Expansion to Scope of Practice

The Alberta College of Optometrists has proposed that within the practice of optometry, optometrists will be able to: prescribe Schedule I drugs; perform non-intraocular, conventional minor optometric surgical procedures involving local anaesthesia (e.g. skin tags, chalazions, etc.); perform limited laser procedures (capsulotomies, peripheral iridotomies and selected laser trabeculoplasty); order ionizing and non-ionizing radiation; apply non-ionizing radiation (ultrasound) for the purposes of taking ocular measurements and allowing the visualization of ocular tissues through hazy media; independently manage and treat glaucoma patients and ordering of laboratory tests. Regulatory colleges and other stakeholders made submissions on or before Sept. 08, 2012 to the Health Professions Advisory Board by and a hearing of verbal presentations was subsequently held on Nov. 06, 2012.

Expansion proposée du champ d'exercice

L'Ordre des optométristes de l'Alberta a proposé que dans l'exercice de leur profession, les optométristes puissent prescrire des médicaments de l'Annexe I; pratiquer des interventions chirurgicales optométriques mineures conventionnelles non intraoculaires comportant une anesthésie locale (p. ex., acrochordons, chalazions, etc.); pratiquer des interventions limitées au laser (capsulotomies, iridotomies périphériques et trabéculoplasties au laser); prescrire des traitements aux rayonnements ionisants et non ionisants; appliquer des rayonnements non ionisants (échographie) afin de prendre des mesures oculaires et de visualiser les tissus oculaires à travers des milieux flous; gérer et traiter en autonomie des patients qui ont le glaucome et commander des examens de laboratoire. Electronic Data Interchange L'ACO rencontrera sous peu la direction de TELUS Santé pour discuter des préoccupations des membres en ce qui concerne la détermination de l'admissibilité des patients et les paiements directs. L'ACO insistera sur la nécessité de simplifier les services et sur le besoin d'un dépannage efficace.

Canadian Ophthalmological Society (COS) Clinical Practice Guidelines (CPGs) – Diabetic Retinopathy

The COS recently released its evidence-based CPGs for the management of diabetic retinopathy. This document, developed by a team of Canadian ophthalmologists, synthesizes the results of a comprehensive literature review and provides evidence-based guidelines to assist ophthalmologists to provide the best contemporary care to their patients with diabetes and diabetic retinopathy. Dr. Philip Hooper, chair, COS Diabetic Retinopathy Clinical Practice Guideline Expert Committee also took the opportunity to thank the CAO Diabetes Committee for its participation in the development of the Diabetic Retinopathy CPGs as an external reviewer. The document is available online at the following link: www.eyesite.ca/resources/CPGs/COS-Diabetic-Retinopathy_e.pdf.

Guide de pratique clinique (GPC) de la Société canadienne d'ophtalmologie (SCO) – Rétinopathie diabétique

La SCO a dévoilé récemment son GPC factuelle pour la gestion de la rétinopathie diabétique. Ce document produit par une équipe d'ophtalmologistes canadiens résume les résultats d'une recension détaillée des écrits et présente des guides de pratique factuelle afin d'aider les ophtalmologistes à fournir les meilleurs soins modernes à leurs patients qui ont le diabète et une rétinopathie diabétique. Le Dr Philip Hooper, président, Comité d'experts sur le Guide de pratique clinique de la SCO pour la gestion de la rétinopathie diabétique a aussi profité de l'occasion pour remercier le Comité du diabète de l'ACO pour avoir participé à la production de GPC sur la rétinopathie diabétique à titre d'examinateur de l'extérieur. Le document est disponible en ligne à l'adresse suivante : www.eyesite.ca/resources/CPGs/COS-Diabetic-Retinopathy_f.pdf

CNIB Diabetic Retinopathy Web Section

CNIB announced the launch of a new diabetic retinopathy section on its website. The initiative was made possible by a grant from the Public Health Agency of Canada and included a range of public education projects. Dr. Paul Chris, executive director, Vision Institute of Canada is an optometric member of the steering committee. The link to the web section is: cnib.ca/dr.

Section Web de l'INCA sur la rétinopathie diabétique

L'INCA a annoncé le lancement, sur son site Web, d'une nouvelle section sur la rétinopathie diabétique. Cette initiative rendue possible grâce à une subvention de l'Agence de la santé publique du Canada a inclus tout un éventail de projets d'éducation publique. Le Dr Paul Chris, directeur général, Vision Institute of Canada, est membre optométriste du Comité de direction. Le lien vers la section Web est le suivant : cnib.ca/dr.

An Evidence-Based Guideline for the Frequency of Optometric Eye Examinations

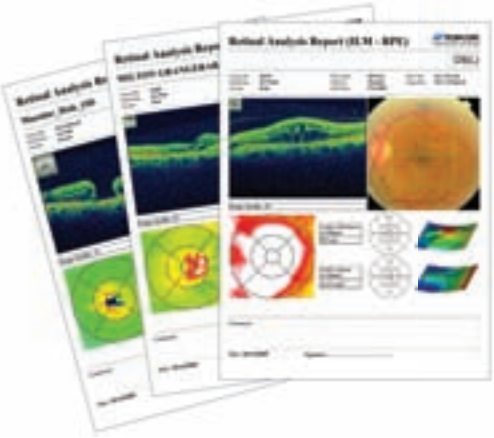
CAO is pleased to announce that our evidence based guideline for the Frequency of Optometric Eye Examinations has been accepted for publication in the online journal Primary Health Care – Open Access. A highlight summary of the guideline may be found on the CAO website at the following link: opto.ca/wp-content/uploads/advocacy/Frequency_of_Eye_Exams_Sept2012.pdf.

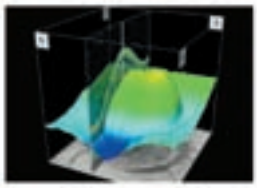
3D OCT-2000

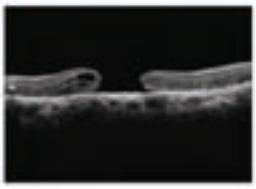
Spectral Domain OCT with a non-mydriatic, colour fundus camera

The **TOPCON 3D OCT-2000 SYSTEM** is the first Spectral Domain OCT system to incorporate a high resolution fundus camera and a userfriendly colour touch screen display in a compact, space saving design.

Ease of use was the primary objective in the design of the 3D OCT-2000. Combining a fully intuitive, automated image acquisition process (focus, z-offset, polarization, fundus capture, small pupil) with Topcon's user friendly, ergonomic camera design, makes the capture of high quality images quick and easy for almost anyone.







WHAT MAKES THE TOPCON 3D OCT-2000 UNIQUE:

- Integrated, high resolution (16.2 MP) fundus camera
- FastMap™ software enables dynamic viewing of 2D, 3D and fundus images simultaneously
- Normative database
- 50,000 A-Scans per second
- Anterior segment scanning
- Drusen analysis
- Ganglion cell layer assessment

TOPCON CANADA INC.

Exclusive canadian distributor for: Topcon, Amtek, Welch Allyn, Paradigm (Dicon), Gulden, M&S Technologies, Tinsley (Selected Products), Icare

www.topcon.ca

e-mail: info@topcon.ca

Eastern Canada	Ontario	Western Canada
1-800-361-3515	1-800-387-6768	1-800-661-8349

CONNECTING VISIONS

EYES NEED ULTRA PROTECTION

AGAINST DAMAGING ULTRAVIOLET LIGHT

essilor

New generation of Crizal lenses with Backside UV Protector

25 E-SPF EYE-SUN PROTECTION FACTOR

So safe

- The new generation of Crizal features Broad Spectrum Technology to provide **maximum protection against UV reflected on the backside** for long-term eye health. When paired with a safer lens material, the new generation of Crizal provides the **most complete protection** against the harmful and often irreversible effects of UV damage.
- Safer lens materials protect against front side UV exposure.

So clear

- The new generation of Crizal provides long-lasting superior clarity of vision by **eliminating glare, scratches, smudges, dust and water.**
- Wearers will enjoy safer, more comfortable vision with a thinner, lighter and more impact-resistant lens material.

Xperio® The polarized experience

Transitions® ADAPTIVE LENSES

Airwear®

Crizal®

Live life in the clear

www.crizal.ca

Transitions and the swirl are registered trademarks of Transitions Optical, Inc.

Ligne directrice factuelle sur la fréquence des examens de la vue

L'ACO est heureuse d'annoncer que notre ligne directrice factuelle sur la Fréquence des examens de la vue a été acceptée pour publication dans le journal en ligne Primary Health Care – Open Access. On trouve un résumé des points saillants de la ligne directrice sur le site Web de l'ACO : opto.ca/wp-content/uploads/advocacy/Frequence_des_examens_des_yeux_sept2012.pdf.

The Health Action Lobby (HEAL)

Formed in 1991, HEAL is a coalition of 35 national health organizations, including CAO, that represents a broad cross-section of health providers, health regions, institutions and facilities. HEAL represents more than half-a-million providers and HEAL welcomes the report of the Health Care Innovation Working Group (HCIWG) of the Council of the Federation. The HCIWG was launched by Canada's premiers in January 2012 to look at how the provinces and territories can improve the quality of care that Canadians receive and overall system performance through shared innovations in service delivery that provide better health, better care and better value for consumers of health care. A copy of the HEAL position statement may be found here: healthactionlobby.ca/en/media-centre/115-heal-supports-council-of-the-federation-report-on-health-innovation.html.

Le Groupe d'intervention action santé (HEAL)

Créé en 2001, le groupe HEAL est une coalition de 35 organismes nationaux du secteur de la santé, y compris l'ACO, qui représentent un vaste éventail de fournisseurs, de régions, d'établissements et d'installations du secteur de la santé. Le groupe HEAL représente plus d'un demi-million de fournisseurs et se réjouit du rapport du Groupe de travail sur l'innovation en soins de santé (GTIS) du Conseil de la fédération. Lancé par les premiers ministres du Canada en janvier 2012, le GTIS a été chargé de déterminer comment les provinces et les territoires peuvent améliorer la qualité des soins que reçoivent les Canadiens, ainsi que le rendement global du système, par des innovations partagées au niveau de la prestation des services qui fournissent une meilleure santé, de meilleurs soins et une meilleure valeur aux consommateurs de soins de santé. Une copie de l'énoncé de position du groupe HEAL se trouve à l'adresse suivante : healthactionlobby.ca/en/media-centre/115-heal-supports-council-of-the-federation-report-on-health-innovation.html.

Aboriginal Vision Health

The National Collaborating Centre for Aboriginal Health has updated its webpage about its priority to promote aboriginal vision health. The web page includes a range of resources including those available from CAO. See the following link: www.nccah-ccnsa.ca/230/Promoting_Aboriginal_Vision_Health.nccah

Santé de la vision chez les Autochtones

Le Centre national de collaboration de la santé autochtone a mis à jour sa page Web au sujet de sa priorité qui consiste à promouvoir la santé de la vision chez les Autochtones. La page Web présente un éventail de ressources, y compris celles qu'offre l'ACO. Consultez le lien suivant : www.nccah.netedit.info/231/pour-promouvoir-la-sante-oculaire-des-autochtones.nccah.

Student Relations

In 2008, CAO launched a new free student membership program available to all registered optometric students in North America. There is currently over 600 student members who have access to CAO programs, the member website, CJO and In Touch newsletter. CAO also pays for lab coats for optometry students at Canadian schools of optometry and the CAO president attends annual white coat ceremonies. CAO provides the Canadian Association of Optometric Students (CAOS) with financial/in-kind support and travel expenses for their executive to attend the CAO Congress and the annual Optometric Leaders' Forum. CAO also sponsors annual bursaries at the two schools of optometry in Canada. In 2010, CAO assumed the sponsorship of the Practice Management Course at UW. Dr. Henry Smit, is the Student Liaison for CAO Council. For more information about student membership, visit www.opto.ca/about-cao/membership or contact CAO at info@opto.ca.

Relations avec les étudiants

En 2008, l'ACO a lancé à l'intention des étudiants un nouveau programme d'adhésion gratuite offert à tous les étudiants de l'Amérique du Nord inscrits en optométrie. Il y a actuellement plus de 600 membres étudiants qui ont accès aux programmes de l'ACO, au site Web des membres, à la RCO et au bulletin Contact. L'ACO paie aussi les blouses blanches pour les étudiants des écoles d'optométrie du Canada et le président de l'ACO assiste à des cérémonies annuelles de la blouse blanche. L'ACO fournit à l'Association canadienne des étudiants en optométrie (ACEO) de l'aide financière et en services et des frais de déplacement pour permettre aux membres de la direction d'assister au Congrès de l'ACO et à la réunion du Forum des dirigeants optométriques. L'ACO parraine aussi des bourses d'études annuelles aux deux écoles d'optométrie du Canada. En 2010, l'ACO a parrainé le cours sur la gestion d'un cabinet à l'UW. Le Dr Henry Smit assure la liaison entre les étudiants et le Conseil de l'ACO. Pour en savoir davantage au sujet de l'adhésion des étudiants, visitez www.opto.ca/a-propos-aco/membres-de-laco ou communiquez avec l'ACO à info@opto.ca.

Medical Ophthalmology Practice available in Toronto

Enquiries can be sent to: joshestelle@rogers.com

Please include your phone number.

Class Reunions at the CAO Biennial Congress

Catch up with classmates, fellow alumnae and friends the evening of **Friday July 12, 2013.**

The Canadian Association of Optometrists (CAO) 33rd Biennial Congress, held in Edmonton, Alberta from July 10-13, 2013 offers a good mix of top quality continuing education sessions for optometrists and optometric staff, the Optofair trade show, business meetings, and a social program for optometrists and their families. To boot, the Calgary Stampede is in full swing, July 5th to the 14th!

You don't need to be a Waterloo grad to gather together your fellow classmates for a night out July 12th. Some graduate classes reunite at this event each Congress year. It is your turn to have a presence!

Ensure a good turnout, by sending a few emails or making phone calls to classmates, and encourage them to come. The CAO national office will send you a student list of your class year upon request to help you get the ball rolling. Please contact: info@opto.ca.

Information specific to your graduating class/school will be available at the congress registration area.

WHAT ELSE CAN YOU DO IN 10 SECONDS?

- Auto Refraction
- Keratometry
- Placido Disc Topography
- 11,880 Corneal Data Points
- Wavefront Aberrometry
- 2,520 Wavefront Data Points
- SA Cornea for Aspheric IOL selection
- Lenticular- Residual Astigmatism
- Angle Kappa
- Pre/Post Toric IOL Measurements
- Mesopic/Photopic Pupil Size
- Point Spread Function
- Zernike Graphs
- Corneal Refractive Power Map
- IOL Tilt/ Decentration
- Difference Maps-Pre/Post Healing
- WF Optimized Rx
- Day/Night Rx
- RMS Values
- Customized Colour Maps
- EMR Compatibility
- Network Integration
- Viewing software available for Exam Lane
- Pathology Discernment

ALL IN 10 SECONDS

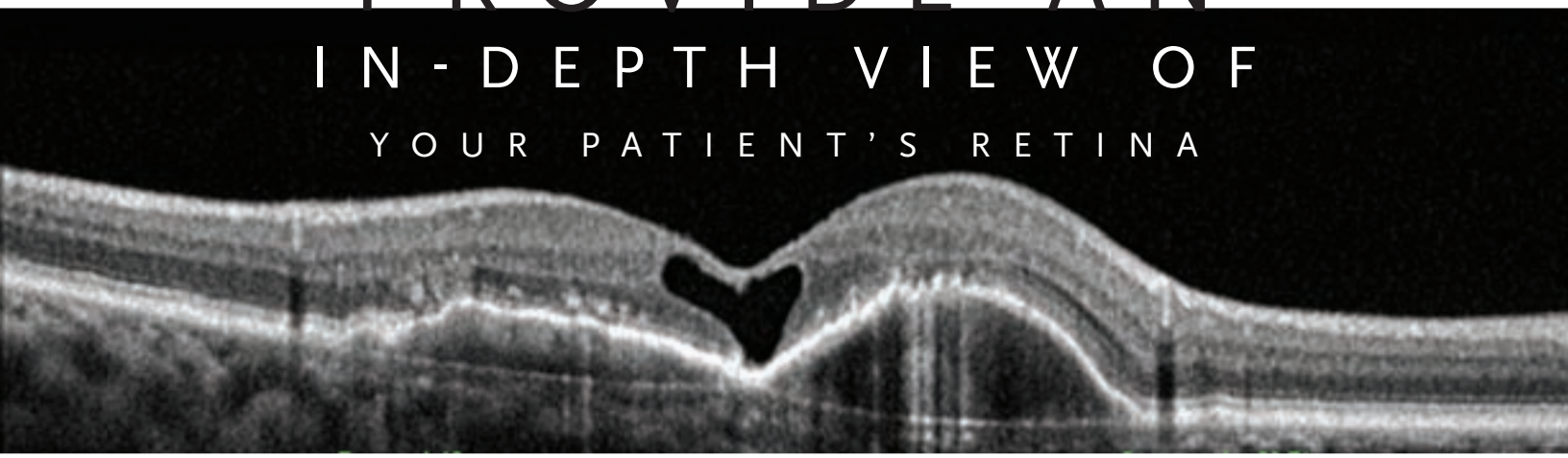
NIDEK OPD SCAN 3

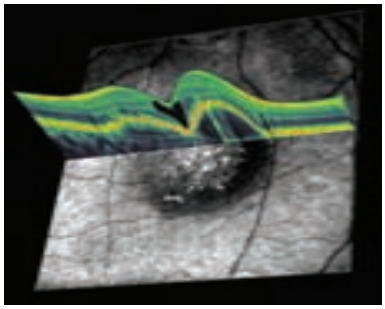
INNOVA

T. 800.461.1200 www.innovamed.com

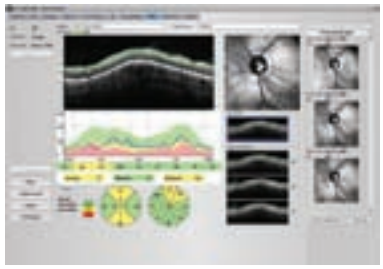
NIDEK

PROVIDE AN IN-DEPTH VIEW OF YOUR PATIENT'S RETINA

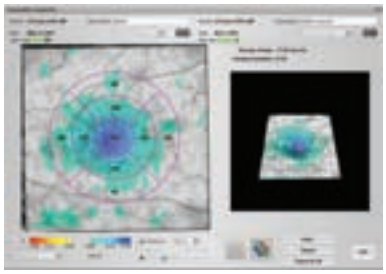




For every OCT Scan there is a corresponding SLO image automatically captured in real-time.



Glaucoma screening exam.



Retinal thickness change following treatment.

The Optos OCT SLO is the only imaging platform available that delivers OCT imaging, SLO retinal tracking and functional testing through the use of an integrated Microperimeter. With an intuitive user-friendly interface, Optos OCT SLO captures structural OCT images and analyses retinal visual function on a selected fundus area. These high resolution images show subtle structural changes allowing better patient analysis and care. SLO tracking and registration compensates for eye movement giving refined image quality, test reliability, repeatability and reproducibility. To see more, visit **optos.com/octslo**

OptosOCT SLO

Retina Glaucoma Cornea Analysis

Building *The* Retina Company

©2012 Optos. All rights reserved. Optos®, Optos OCT SLO and optos® are registered trademarks of Optos plc. P/N GA-00034/1

optos®

optos.com

Humanitarian mission in Ecuador | Mission humanitaire en Équateur

The line of patients that were waiting for us each morning in Cuenca / La lignée de patients qui nous attendaient à chaque matin à Cuenca.

BY/ PAR VALÉRIE SAVOIE,
OPTOMETRY STUDENT AT THE UNIVERSITY OF MONTREAL /ÉTUDIANTE EN OPTOMÉTRIE À L'UNIVERSITÉ DE MONTRÉAL

In May 2012, I was one of 14 students from the University of Montreal School of Optometry who volunteered to participate as part of a humanitarian mission in Ecuador with the organization VOSH/International: Volunteer Optometric Services to Humanity. Our team also included 10 students from the University of Waterloo, six optometrists, two opticians and eight volunteers.

Every summer, students who have completed their second year of optometry, have the opportunity to volunteer for a mission to help in developing countries, enhance their knowledge of optometry and live a unique experience. During the mission, they are assigned to triage, exams or the dispensary. On average, we examined 400 patients per day and several of these patients were fitted with glasses. We saw many types of eye conditions, such as big cylinders, diabetic retinopathy, advanced cataracts, pterygiums and even cranial nerve palsies, Marcus Gunn pupils and nystagmuses!

My Tien PHAM, 3rd year Montreal student, is performing a retinoscopy with a lens bar / My Tien PHAM, étudiante en 3e année à Montréal, effectue une rétinoscopie avec une barre de lentilles.

The mission was also a great opportunity for us to practice our Spanish, although there were always translators available at the clinic for those who needed them. We examined patients of all ages, from infants to elders, thus performing exams on a very diverse population. The patients were very appreciative of our services and we received big "muchas gracias" and even hugs and kisses! We also brought souvenirs from Canada, such as pencils and stickers, that made the little ones very happy.

We had a few days of clinic in the city of Guayaquil, followed by a few more days in the city of Cuenca. The humanitarian part of our trip lasted two weeks and the group stayed an extra week to tour the capital, Quito. During our stay in Quito, we went to the "Mitad del Mundo" (Middle of the World) to visit the equator and take a picture with one foot in each hemisphere!

In August 2012, another group of students from Montreal and Waterloo travelled to Peru for another humanitarian mission with VOSH.

VOSH is always looking for optometrists who want to share their knowledge with students and are committed to helping communities in developing countries. If you are interested in participating in a humanitarian mission like this one, you can contact Pierre Labine at pierre.labine@sympatico.ca or visit the web site www.vosh.org.

Lors du mois de mai 2012, je fus l'une des quatorze étudiants et étudiantes de l'école d'optométrie de l'Université de Montréal qui se sont portés bénévoles pour une mission humanitaire en Équateur avec l'organisme VOSH/International : Volunteer Optometric Services to Humanity. Notre groupe de bénévoles incluait également dix étudiants de l'Université de Waterloo, six optométristes, deux opticiens et huit bénévoles.

À chaque été, les étudiants qui viennent de compléter leur 2e année du doctorat en optométrie ont l'occasion de partir en mission afin d'aider un pays en voie de développement, approfondir leurs connaissances en optométrie et vivre une expérience unique. En mission, ils sont soit assignés au triage, aux examens ou au dispensaire de lunettes. En moyenne, l'équipe a examiné 400 patients par jour et plusieurs d'entres eux se sont fait ajuster des lunettes. De plus, nous avons pu voir plusieurs conditions oculaires, telles que des gros cylindres, de la rétinopathie diabétique, des cataractes avancées, des ptérygions et même des paralysies de nerfs crâniens, des pupilles de Marcus Gunn et des nystagmus!

La mission était aussi une opportunité fantastique pour pratiquer notre espagnol, mais il y avait des traducteurs de disponibles à la clinique pour ceux qui en avaient besoin. Nous avons vu des patients de tous les âges, des nourrissons aux personnes âgés, donc nous avons pu examiner une population très diversifiée. Les patients étaient très reconnaissants de nos services et nous avons reçu des gros « muchas gracias » et même des caresses et des bisous! Nous avons aussi apporté des souvenirs du Canada, comme des crayons et des collants, ce qui a rendu les plus petits très heureux.

Nous avons fait quelques jours de clinique dans la ville de Guayaquil et ensuite dans la ville de Cuenca. La partie humanitaire du voyage comptait deux semaines et nous sommes restés une semaine de plus afin de visiter la capitale, Quito. Durant notre séjour à Quito, nous sommes même allés à la « Mitad del Mundo » (Moitié du Monde) pour visiter l'équateur et prendre une photo avec un pied dans chaque hémisphère!

Au mois d'août 2012, un autre groupe d'étudiants de Montréal et Waterloo sont partis au Pérou pour une autre mission humanitaire avec VOSH.

VOSH est toujours à la recherche d'optométristes qui veulent partager leurs connaissances avec les étudiants et étudiantes et s'engager à aider les communautés des pays en voie de développement. Si vous êtes intéressés à participer à une telle mission humanitaire, vous pouvez communiquer avec Pierre Labine à pierre.labine@sympatico.ca ou visitez le site Web www.vosh.org.

The Canadian Association of Optometry Students (CAOS) at the Rosenberg School of Optometry (RSO), gathered together to celebrate a delicious Thanksgiving dinner in October, and discussed the goals of COAS-RSO Chapter. They passed out student membership forms for CAO and discussed current events in Canadian Optometry, including the proposed expansion to the scope of practice in Alberta as many of these Canadian students are from Calgary or Edmonton. They send their greetings!

BESIVANCE®

Demonstrated efficacy and an excellent safety profile

BESIVANCE® is indicated for the treatment of patients one year of age and older with bacterial conjunctivitis caused by susceptible strains of the following organisms:

Aerobic, Gram-Positive

- CDC coryneform group G
- *Staphylococcus aureus*
- *Staphylococcus epidermidis*
- *Streptococcus mitis*
- *Streptococcus oralis*
- *Streptococcus pneumoniae*

Aerobic, Gram-Negative

- Haemophilus influenzae

BESIVANCE® is contraindicated in patients with known hypersensitivity to this drug, to other quinolones, or to any ingredient in the formulation or component of the container.

NOT FOR INJECTION INTO THE EYE.
FOR TOPICAL OPHTHALMIC USE ONLY.

In three safety and efficacy trials, no serious adverse reactions related to Besivance® were reported. The most frequently reported treatment-emergent ocular adverse events in the study eye were blurred vision (2.1%), eye pain (1.9%), and eye irritation (1.4%).

BAUSCH + LOMB

Bausch & Lomb Canada Inc., Vaughan, Ontario L4K 4B4
®/™ denotes trademark of Bausch & Lomb Incorporated
© Bausch & Lomb Incorporated

Pr Besivance®
besifloxacin ophthalmic suspension, 0.6%

PAAB

See prescribing summary on page 16

Pr Besivance®

Besifloxacin ophthalmic suspension, 0.6%

Prescribing Summary

Patient Selection Criteria

THERAPEUTIC CLASSIFICATION
Antibacterial (ophthalmic)
INDICATIONS AND CLINICAL USE
BESIVANCE® is indicated for the treatment of patients one year of age and older with bacterial conjunctivitis caused susceptible strains of the following organisms:
Aerobic, Gram-Positive
- *CDC coryneform group G*
- *Staphylococcus aureus*
- *Staphylococcus epidermidis*
- *Streptococcus mitis*
- *Streptococcus oralis*
- *Streptococcus pneumoniae*

Aerobic, Gram-Negative
- *Haemophilus influenzae*

CONTRAINDICATIONS
BESIVANCE® is contraindicated in patients with known hypersensitivity to this drug, to other quinolones, or to any ingredient in the formulation or component of the container.
Special Populations
Geriatrics (> 60 years of age): No overall differences in safety and effectiveness have been observed between elderly and younger patients.
Pediatrics (< 1 years of age): The safety and effectiveness of BESIVANCE® in infants less than 1 year of age have not been established.
Pregnant Women: BESIVANCE® should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.
Nursing Women: Caution should be exercised when BESIVANCE® is administered to a nursing mother.

Safety Information

WARNINGS AND PRECAUTIONS
General
NOT FOR INJECTION INTO THE EYE. FOR TOPICAL OPHTHALMIC USE ONLY.
BESIVANCE® is a sterile suspension for topical ophthalmic use only, and should not be injected subconjunctivally, nor should it be introduced directly into the anterior chamber of the eye. There are no data to support use of BESIVANCE® in patients with concomitant corneal injury/damage.
Contact Lenses: Patients should be advised not to wear contact lenses if they have signs and symptoms of bacterial conjunctivitis or during the course of therapy with BESIVANCE®.
Growth of Resistant Organisms with Prolonged Use: As with other anti-infectives, prolonged use of BESIVANCE® may result in overgrowth of non-susceptible organisms, including fungi. If super-infection occurs, discontinue use and institute alternative therapy. Whenever clinical judgment dictates, the patient should be examined with the aid of magnification, such as slit-lamp biomicroscopy and, where appropriate, fluorescein staining.
Carcinogenesis and Mutagenesis
Long-term studies in animals to determine the carcinogenic potential of besifloxacin have not been performed.
ADVERSE REACTIONS
Adverse Drug Reaction Overview
In three safety and efficacy trials with 2377 patients enrolled, no serious adverse reactions related to BESIVANCE® were reported. The most frequently reported treatment-emergent ocular adverse events in the study eye were blurred vision (2.1%), eye pain (1.9%), and eye irritation (1.4%).
To report an adverse event, contact your Regional Adverse Reaction Monitoring Office at 1-866-234-2345 or Bausch + Lomb at 1-888-459-5000

Administration

Instill one drop in the affected eye(s) 3 times a day for 7 days. If a dose of this medication has been missed, it should be taken as soon as possible. However, if it is almost time for the next dose, the missed dose should be skipped and return to the regular dosing schedule. Do not double dose.
Patients should be advised to thoroughly wash hands prior to using BESIVANCE®. Patients should be advised to avoid contaminating the applicator tip with material from the eye, fingers or other source.
Patients should be instructed to invert closed bottle (upside down) and shake once before use. Remove cap with bottle still in the inverted position. Tilt head back, and with bottle inverted, gently squeeze bottle to instill one drop into the affected eye(s).

SUPPLEMENTAL PRODUCT INFORMATION
WARNINGS AND PRECAUTIONS
Immune
Anaphylaxis and Hypersensitivity:
Besifloxacin is only commercially available for topical ophthalmic administration. While anaphylaxis or other hypersensitivity reactions have not been observed with topical ophthalmic use of besifloxacin in humans, the potential for such reactions should be considered since patients with known hypersensitivity to fluoroquinolones were excluded from clinical trials.
In patients receiving systemically administered quinolones, serious and occasionally fatal hypersensitivity (anaphylactic) reactions have been reported, some following the first dose. Some reactions were accompanied by cardiovascular collapse, loss of consciousness, angioedema (including laryngeal, pharyngeal or facial edema), airway obstruction, dyspnea, urticaria, and itching. If any allergic reaction occurs, BESIVANCE® should be discontinued and appropriate therapy should be administered as clinically indicated.
Bacterial Conjunctivitis Trials
The rates of the most common treatment-emergent ocular adverse events irrespective of causality observed in eyes treated with BESIVANCE® during the three bacterial conjunctivitis clinical trials are displayed in Table 1.

Table 1 - Incidence (%) of Treatment-Emergent Adverse Events Irrespective of Causality that Occurred in ≥ 1% of Study Eyes/Patients Treated with BESIVANCE® or Vehicle in Bacterial Conjunctivitis Studies (Population: Safety1)

Adverse Events	Besifloxacin n=1187 (%)	Vehicle n= 614 (%)
Eye Disorders		
Vision Blurred	25 (2.1%)	24 (3.9%)
Eye Irritation	17 (1.4%)	18 (2.9%)
Eye Pain	22 (1.9%)	11 (1.8%)
Conjunctivitis	14 (1.2%)	15 (2.4%)
Eye Pruritus	13 (1.1%)	10 (1.6%)
Conjunctivitis Bacterial	7 (0.6%)	9 (1.5%)
Nervous System Disorders		
Headache	21 (1.8%)	11 (1.8%)

1 Safety population includes subjects treated for bacterial conjunctivitis that were randomized and received at least one dose of the study drug in the three safety and efficacy studies. BESIVANCE® was tested in all three studies, while the vehicle was tested in only two of the studies.

Less Common Clinical Trial Adverse Drug Reactions (<1%)
Treatment-related adverse events (possibly, probably or definitely related) reported in 0.1 to 1.0% of eyes receiving BESIVANCE® included:
Eye Disorders: eye pruritus, dry eye, conjunctivitis, conjunctivitis bacterial, punctate keratitis, conjunctival oedema, eye discharge, corneal infiltrates, corneal staining, eyelid margin crusting, keratoconjunctivitis sicca, foreign body sensation in eyes, conjunctival follicles, dry skin, eye disorder, instillation site pain, photophobia, visual disturbance.
Nervous System Disorders: headache
SYMPTOMS AND TREATMENT OF OVERDOSAGE
No information is available on overdosage of BESIVANCE®. A topical overdose of BESIVANCE® may be flushed from the eye(s) with warm tap water.

Full Product Monograph available for health professionals at: http://www.bausch.ca

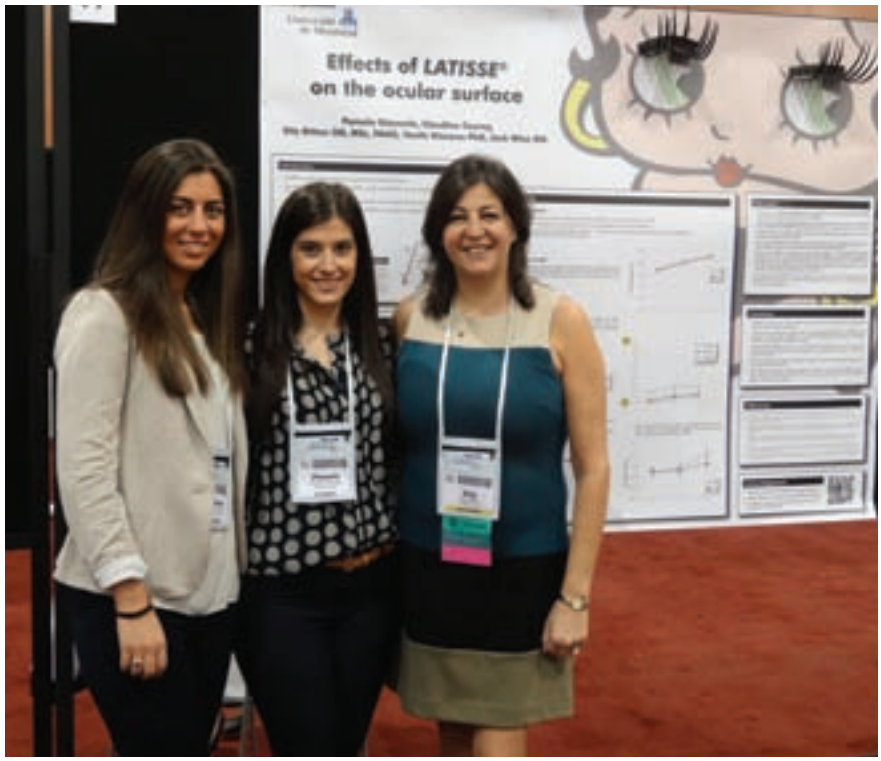
BAUSCH + LOMB

PAAB

Bausch & Lomb Canada Inc., Vaughan, Ontario L4K 4B4
®/™ denotes trademark of Bausch & Lomb Incorporated
© Bausch & Lomb Incorporated

Canadians triumph at Academy 2012 Phoenix

Proud new 2012 FAAO, Holly Lorentz (Waterloo)



Poster presentation by Claudine Courey, Pamela Giancola and Etty Bitton (Montreal)

By Dr. Etty Bitton and Dr. Luigina Sorbara

Over 5,100 attendees gathered for the American Academy of Optometry's (AAO's) annual meeting last October held in Phoenix, Arizona.. Nearly 250 attendees were from Canada. This is by far the largest optometric meeting in North America, combining continuing education, hands-on workshops, scientific presentations and the latest advancements from over 200 companies at the exhibit hall. The AAO annual meeting is also well attended by an increasing number of optometry students and residents. Several activities are targeted specifically for students to offer them career opportunities such as residencies, graduate studies and a place to network with others from around the country. Schools and colleges of optometry also capitalize on this well attended event to reunite with alumni.

Both the École d'optométrie, Université de Montréal and the School of Optometry and Vision Science, University of Waterloo contributed to the meeting via lectures and presentations. Tables 1-2 summarize the contribution of both schools to this year's meeting.

> *"...This experience pushed me to network, find out about new products, to meet students from other Optometry schools, and get to know my school's faculty and future colleagues better. I am delighted to have had the chance to attend the conference as a student and encourage all students to do the same. This experience made me appreciate the profession of Optometry even more and I look forward to attending future Academy meetings for years to come."*
>
> *– Michèle Arthurs, École d'optométrie, Université de Montréal*

Every year, several optometrists and scientists complete the requirements for fellowship with AOA. At the annual meeting, those who have completed the requirements are invited to sit for an oral examination to become Fellows of the American Academy of Optometry (FAAO). Approximately ten per cent of optometrists practicing in the United States have FAAO accreditation. This year, 204 people became fellows representing nine countries (US, Canada, Australia, Hong Kong, Philippines, Germany, Nigeria, Pakistan and Spain). Dr. John Flanagan sat on the Admittance Committee as Chair of Scientific Candidates. Eight proud Canadians were inducted as Fellows of the Academy — Dr. Lisa Christian (Waterloo, Ont.), Dr. Nadine Maria Furtado (Toronto, Ont.), Dr. Ruhee Dhalla Kurji (Edmonton, Alta.), Dr. Holly Lorentz (Hamilton, Ont.), Dr. Derek MacDonald (Waterloo, Ont.),

Dr. Richard Maharaj (Brampton, Ont.), Dr. Karina Cecile Marcovitch (Toronto, Ont.) and Dr. Kevin So (Vancouver, B.C.). ***Congratulations to the new distinguished FAAOs!*** A special congratulation goes to Dr. Luigina Sorbara (Waterloo, Ont.) who celebrated her 25th anniversary as a FAAO!

This year also marked the change of leadership from the AAO. Dr. Karla Zadnik stepped down from the presidency to make way for the new incoming president for the next two years, Dr. Bernie Dolan. Dr. Lyndon Jones stood down after 10 years as Chair of the AAO Research Committee, with a great thank you to him for his time and effort. The American Optometric Foundation (AOF) also saw a change in leadership with Dr. Kathy Dumbleton from the University of Waterloo taking over as president from Dr. Cathie Amos for a two year term. Dr. Cathy Chiarelli from the Vision Institute of Canada in Toronto, also stepped down after 10 years of service on the International Admittance Committee of the AAO. Her commitment and professionalism to the committee was formidable. Dr. John Flanagan (University of Waterloo), a co-founder of the Optometric Glaucoma Society (OGS), stepped down as president of the Society and has become its Executive Vice President. The incoming president of OGS is Dr. Ben Gaddie.

Next year promises to be an even bigger, more successful event. See you all on October 23-26, 2013 in Seattle!

Awards and Travel Grants

Université de Montréal Recipients

Resident travel fellowship (from the section of cornea, contact lens and refractive technologies)
Claudine Courey, OD

Frank W. Weymouth Student Travel Fellowship
Jean-Marie Hanssens, OD

Essilor Student Travel Fellowship
Martin Spiro

◇◇◇◇◇◇◇◇◇

University of Waterloo Recipients

AOF William Ezell Fellowship (Cornea, Contact Lens and Refractive Technologies section)
Alex Hui

Essilor Student Travel Fellowship
Jessica Steen

The Vision Care Institute™ Travel Fellowships
Alan Ng

Alcon Student Travel Fellowship
Amith Hathibelagal

Best paper of AAO meeting awarded by the Scientific Program Committee
Alan Ng

Vistakon Innovation in Education Grant
Lisa Christian
Sarah MacIver

Hot topic of interest by the Press
Sruthi Srinivasan

TABLE 1

École d'optométrie, Université de Montréal
2012 participation at the AAO annual meeting

AUTHOR(S)	TITLE OF PRESENTATION
FACULTY	
Bitton, E.	RED, GREEN OR YELLOW: UNDERSTANDING OCULAR SURFACE STAINING (lecture)
Naroo S., Morgan P., Sorbara G., Jurkus J., **Bitton E.**, Lazon P., Sweeney D.	IACLE: INTERNATIONAL ASSOCIATION OF CONTACT LENS EDUCATORS (poster)
Spafford M., Kennedy R.D., **Brulé J.**	SMOKING CESSATION EDUCATION MATERIALS: A NATIONAL STUDY OF OPTOMETRISTS (paper)
Fraser A., **Marinier J.A.**	COMPARATIVE STUDY OF NEAR VISUAL ACUITIES OBTAINED BY MNREAD AND COLENBRANDER CHARTS IN FRENCH (poster)
Giasson C., Deschenes C., Shamieh H., **Diaconu V.**	INDIRECT TRANSMITTANCE OF A CONTACT LENS IN A WET CELL WITH AN INTEGRATING SPHERE (poster)
Lovasik J.V., Kergoat H., Parent M.	OLDER EYES SHOW LARGER INCREASES IN FLICKER-INDUCED DENSITY THAN YOUNGER EYES (paper)
Kergoat H., Boisjoly H., Freeman E.E., Kergoat M.J., Monette J., Roy S.	THE PERCEIVED NEEDS AND AVAILABILITY OF EYE CARE SERVICES FOR OLDER ADULTS IN QUEBEC NURSING HOMES (Paper)
Pelletier A.A., Théorêt M.E., Boutin T., Kergoat M.J., Massoud F., Latour J., Chayer C., **Kergoat H.**	PREVALENCE OF GLAUCOMA AND STROKE IN AN HOSPITALIZED POPULATION OF OLDER ADULTS HAVING ALZHEIMER'S DISEASE (Poster)
Michaud L.	CONTROVERSIES IN CONTACT LENS CARE (lecture) GRAND ROUNDS CLINICAL (CONTACT LENSES) (lecture)
Michaud L., Woo S., Dinardo-Lotoczky A., Harthan J., Bennett E., Morgan B., Reeder R.	CLINICAL EVALUATION OF A LARGE DIAMETER RIGID-GAS PERMEABLE LENS FOR THE CORRECTION OF REFRACTIVE ASTIGMATISM (poster)
STUDENTS	
Giancola P., Courey C., **Bitton E., Diaconu V.**, Wise J.	EFFECTS OF LATISSE ON THE OCULAR SURFACE (poster)
Kramer E., Gianni R., **Michaud L.**	THE ACCEPTANCE OF AND RESPONSES TO CONTACT LENSES IN SUBJECTS WITH DIABETES (poster)
Thyriar H., Hu., L, Brazeau D., **Michaud L.**	EVALUATION OF THE ROTATION OF LARGE DIAMETER GAS PERMEABLE LENSES ON THE CORNEA (poster)
GRADUATE STUDENTS	
Hanssens JM, Giraudet G, Allard R, Faubert J	VISUALLY INDUCED MOTION SICKNESS DEPENDS ON VELOCITY, NOT TEMPORAL FREQUENCY (poster)
Murphy C, Duponsel N, Gninka T, Overbury O	ARE AGE AND THE DURATION OF VISION IMPAIRMENT A FACTOR IN THE ABILITY TO COPE WITH LOW VISION? (poster)

TABLE 2

University of Waterloo, School of Optometry and Vision Science 2012 participation at the AAO annual meeting

AUTHOR(S)	TITLE OF PRESENTATION
FACULTY	
Naroo S., Morgan P., **Sorbara L.**, Jurkus J., Bitton E., Lazon P., Sweeney D.	IACLE: INTERNATIONAL ASSOCIATION OF CONTACT LENS EDUCATORS (poster)
Flanagan J.	MEASURING 24-HOUR IOP(LECTURE) OGS/AAO JOINT SYMPOSIUM ON EVOLVING GLAUCOMA DIAGNOSTICS
Lonsberry B., **Flanagan J.**	IMAGING OF THE OPTIC NERVE AND RETINA (lecture)
Freddo T.	A CLINICAL OVERVIEW OF THE SECONDARY OPEN-ANGLE GLAUCOMAS (lecture)
Leat S. et al	VISION IN AGING SIG; A FOCUS OF FALLS AND THE DRIVING DEBATE (lecture)
Leat S.	PAEDIATRIC LOW VISION MANAGEMENT: MAKING A START (lecture)
Spafford M., Kennedy R.D., Brulé J.	SMOKING CESSATION EDUCATION MATERIALS: A NATIONAL STUDY OF OPTOMETRISTS (paper)
Spafford M., McGrath C., Zuvella B., Gold D., Laliberte Rudman D.	MAPPING PATHWAYS TO VISUAL REHABILITATION : A STUDY OF OLDER ADULTS WITH AGE-RELATED VISION LOSS (poster)
Christian L., Labreche T.	THE IMPORTANCE OF THE EYE EXAM IN DIAGNOSING PROGRESSIVE SUPRANUCLEAR PALSY (poster)
Holden B.A., Fonn D., LaHood D., **Moezzi A., Richter D.**	REVISED ESTIMATE OF THE OXYGEN TRANSMISSIBILITY NEEDED TO PRODUCE SAME LEVEL OF OVERNIGHT CORNEAL SWELLING AS THAT WHICH OCCURS WHEN NO LENS IS WORN (paper)
Fonn D., Holden B.A., **Moezzi A., Richter D.**, Lazon de la Jara P., LaHood D.	OVERNIGHT CORNEAL SWELLING (ONCS) OF THE CONTRALATERAL NON-LENS WEARING EYE IS AFFECTED BY THE AMOUNT OF ONCS IN THE LENS WEARING EYE (paper)
Richdale K. and CLAY group (**Sorbara L.**)	DEVELOPMENT OF A SOFT CONTACT LENS RISK ASSESSMENT SURVEY (poster)
Kinoshita B, Jansen M and CLAY group (**Sorbara L.**)	CONTACT LENS ASSESSMENT IN YOUTH: TRANSITION FROM RESEARCH TO PRACTICE (lecture)
Sorbara L.	CASE STUDIES: FITTING KERATOCONUS PATIENTS WITH USE OF VKE (lecture)
Dumbleton K., Richter D., Jones L.W.	COMPLIANCE WITH LENS REPLACEMENT AND THE INTERVAL BETWEEN EYE EXAMINATIONS (paper)
Caffery B., **Joyce E.M., Heynen M.**, Ritter R., **Jones L.**	TNF-ALPHA MRNA EXPRESSION IN AQUEOUS DEFICIENT DRY EYE (paper)
Hutchings N., Jayakumar V., **Srinivasan S.**, Dave T., **Keir N., Jones L.**	COMPARISON OF ANTERIOR SURFACE ABERRATIONS BETWEEN SUBJECTS WITH CLINICALLY STABLE AND UNSTABLE TEAR FILMS (poster)
MacIver S., Hutchings N., Sherman J.	QUANTIFICATION OF AREAS OF HYPERFLUORESCENCE IN ULTRA-WIDEFIELD AUTO-FLUORESCENCE IMAGES IN NORMAL AND DISEASED EYES (poster)
MacIver S., Slotnick S., Bass S.J., Sherman J.	CLINICAL UTILITY OF PANORAMIC AUTOFLUORESCENCE IN PATIENTS WITH REDUCED VA (paper)

First time student attendees, Michèle Arthurs and Martin Spiro (Montreal)

TABLE 2, CONTINUED

MacIver S. et al	ELLERBROCK PRESENTS: GRAND ROUNDS IV (lecture)
Leat S.J., Si F., Hodge W., Gold D., Gordon K, Pickering D.	A PILOT STUDY OF CLOSED CIRCUIT TV (CCTV) VERSUS ECCENTRIC VIEWING (EW) TRAINING FOR VISUAL REHABILITATION IN AGE-RELATED MACULAR DEGENERATION (AMD) (poster)
Prokopich C.L, MacIver S.	OFF-LABEL ANTI-VEGF THERAPY IMPROVING LONGSTANDING CORNEAL NEOVASCULARISATION: A NEW APPROACH TO AN OLD PROBLEM (poster)
Srinivasan S., Luensmann D., Otchere H, Yu M, Yang J	THE IMPACT OF COSMETICS ON THE SURFACE APPEARANCE AND WETTABILITY OF SILICONE HYDROGEL CONTACT LENSES (paper)
Subbaraman L., Sheardown H.	INCORPORATING HYDROXYPROPYL GUAR IN MODEL CONVENTIONAL AND SILICONE HYDROGEL CONTACT LENSES (paper)
Varikooty J., Keir N., Jones L.	OPTIMIZATION OF ASSESSMENT AND GRADING FOR LID WIPER EPITHELIOPATHY (paper)
STUDENTS	
Menzies K., Subbaraman L., Jones L.	IN VITRO WETTABILITY COMPARISON OF HYDROGEL AND SILICONE HYDROGEL DAILY DISPOSABLE AND FREQUENT REPLACEMENT CONTACT LENSES (poster)
GRADUATE STUDENTS	
Hathibelagal A.R., Eizenman M., Nandakumar K., Leat S.J.	VALIDATION OF A NEW TECHNIQUE FOR MEASURING INFANT VISUAL ACUITY WITH GAZE TRACKING (paper)
Ng A., Heynen M., Subbaraman L., Jones L.	OPTIMIZATION OF A NOVEL FLUORESCENT BASED LYSOZYME ACTIVITY ASSAY FOR CONTACT LENS STUDIES (paper)
Ommani A., Thapa D., Ramamurthy M., Lu Y., Lakshminarayanan V., Leys M., Mumford R.B., Odom J.V., Kondo T., Wu F.	AN ASSESSMENT OF UNIVERSAL READING ACUITY CHART (poster)
Woods J., Keir N., Jones L.	SOLUTION INDUCED CORNEAL STAINING (SICS): SYMPTOMS AND STAINING PATTERNS (poster)

Exclusively yours...

Since the CAO ENCORE frame line was launched in 2007, it has proved to be a WIN/WIN/WIN program for all participants.

Encore, Encore Sophisticate and Encore kids provide excellent choices and value for the entire family. Also available is an aggressively priced Lab Pak combining Encore frames with a wide selection of lenses Including the Universa HD customized progressive By Carl Zeiss Vision.

The Encore frame line, Universa HD lenses and the Lab Pak provide CAO members with exclusive private labelled frames and lenses at competitive prices. The programs also provide CAO with non dues funds to support its efforts to represent Optometry in Canada. It is no surprise that this important member program continues to grow.

For more information contact your Centennial / Centoptic sales representative 1-800-561-6284

Diagnosis and management of a full thickness macular hole

BY NICOLAS FONTAINE[1], OD, MSc.
SÉBASTIEN OLIVIER[2], MD, OD

Introduction

A macular hole is a condition where part (lamellar macular hole – LMH) or the full extent (full-thickness macular hole – FTMH) of the sensory retina is detached from the rest of the retina, in the central or macular region of the retina. The diagnosis is usually quick, because most patients report severe impairment of central vision, which develops over the course of a few days or weeks at most. Evidence obtained with retinal imagery, mostly Optical Coherence Tomography (OCT), seems to indicate that separation of part or the entire extent of the retina results from an abnormal vitreo-foveolar attachment.[1] In many instances, the presence of an epiretinal membrane (ERM) connecting the sensory retina to the vitreous body has been noted.[1] With senescence, the vitreous body, contained in the central cavity of the ocular globe, shrinks and liquefies. The hyaloid membrane, which envelops the vitreous, detaches itself from the inner limiting membrane (ILM) of the retina. If abnormally high adherence exists between both structures, anteroposterior and tangential forces are exerted on the surface of the retina.[2] As a result, part of the sensory retina is pulled away and may ultimately be torn away. Intravitreal fluid will seep through the hole and detach and disorganize the surrounding photoreceptors of the macular region.[3] The process leading to the diagnosis of a full-thickness macular hole is illustrated in this case report, followed by successful treatment and resolution of the condition.

1 *Assistant professor, École d'Optométrie, Université de Montréal*

2 *Lecturer, Department of Ophthalmology, Faculty of Medicine, Université de Montréal*

RÉSUMÉ

Contexte : Les trous maculaires ne sont pas toujours faciles à identifier à un stade précoce, à moins de procéder à des tests d'imagerie médicale. Le diagnostic différentiel par rapport à d'autres atteintes maculaires est souvent possible pour un oeil expérimenté grâce à l'utilisation d'une lentille binoculaire de fond d'œil. Cependant, l'avènement de la tomographie à cohérence optique facilite un diagnostic exact.

Rapport de cas : Ce rapport montre un cas classique de trou maculaire de pleine épaisseur. Les signes cliniques ne sont pas pathognomoniques au début, mais des signes probants se développeront dans les semaines suivantes. Les différentes étapes de la maladie sont décrites, de même que les modalités de traitement chirurgical et les résultats attendus.

Conclusions : Un diagnostic précoce permet une récupération rapide de la vision. Néanmoins, cette atteinte peut être traitée jusqu'à un an après l'apparition des premiers signes avec une amélioration significative de la fonction visuelle.

ABSTRACT

Background: First stage macular holes are not always easily identified without the use of medical imagery. Differential diagnosis from other macular conditions is possible with a keen eye and the use of a binocular fundus lens. However, the advent of optical coherence tomography facilitates accurate diagnosis.

Case Report: This report demonstrates a classical case of a full thickness macular hole. The clinical signs are not pathognomonic at first, but typical signs develop in the following weeks. The different stages of the disease are described, as well as current state of surgical treatment and possible outcomes.

Conclusions: Early diagnosis allows quick visual recovery. Nevertheless, this condition can be treated up to one year after occurrence with significant improvement of visual function.

Key words: *full-thickness macular hole (FTMH), Optical Coherence Tomography (OCT), pars plana vitrectomy (PPV), membrane peeling, gas tamponade*

Case report

A 65-year-old Caucasian female presented to our clinic on November 16th, 2010 with complaints of a "black dot" in the center of the visual field of the right eye which appeared one week before and had been growing since. Vision from this eye had been blurred for almost a month. She was a patient

of our clinic for 11 years, and suffered from minor water retention and dyslipidemia. Her medications were risedronate sodium 5 mg (Actonel™), atorvastatin calcium 10 mg (Lipitor™), calcium carbonate 1500 mg (Caltrate™), furosemide 20 mg (Lasix™) and vitamin B12. She reported no allergies. Routine ocular fundus photography had been performed with a Canon CR-DGi camera (Japan) on her last routine exam on October 1st 2007 (*right eye shown on Figure 1*). Aside from some small drusen at the macula OU, there were no particular ocular findings. Best-corrected Snellen distance visual acuity (BCVA) was 6/6 (20/20) for each eye, with -0.75D correction OU.

Her corrected visual acuity (VA) was now 6/24+1 (20/80+1) OD and 6/7.5+1 (20/25+1) OS. Pinholes provided no improvement. Pupils were equally round and reactive to light, and no afferent pupillary defect was noted. Anterior segment evaluation by slit lamp examination was within normal limits. Amsler grid testing was normal OS, however, a small central metamorphopsia was documented OD. The patient's pupils were then dilated. The results of an evaluation of the posterior segment by slit lamp with a 78D fundus lens and by binocular indirect ophthalmoscope were all normal except that the macula of the right eye presented with a small light grey flat lesion with diffuse border (*Figure 2*), the macula of the left eye (not shown on the figure) showed 5 small drusen. There was no foveal reflex in either eye. The vitreous was clear OU with no presence of a Weiss's ring in either eye. The Watzke-Allen test was performed on the right eye with negative result.

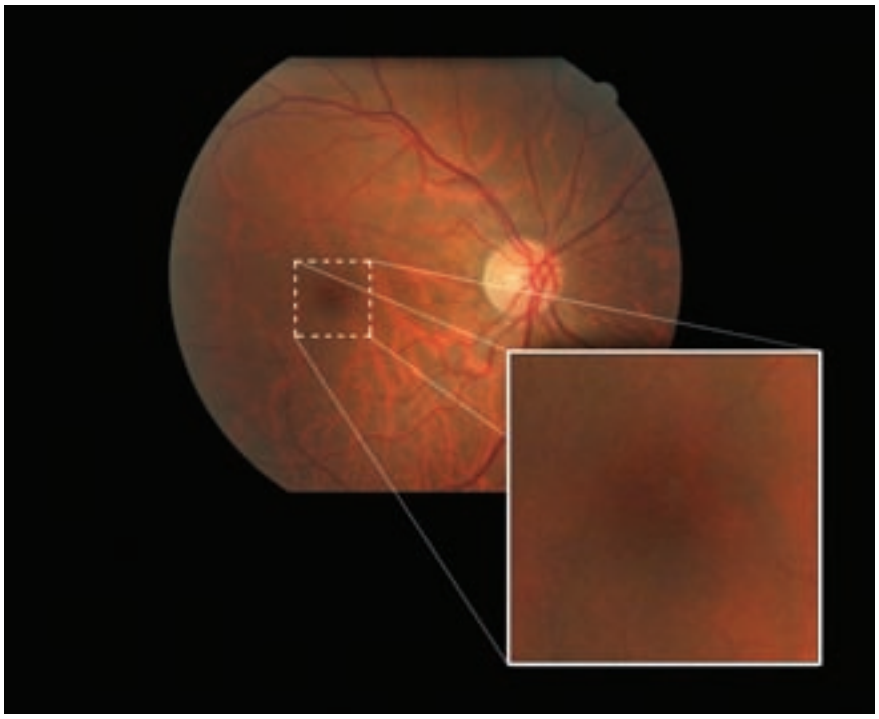


Figure 1 – *Fundus photography shows small macular drusen in the right eye.*

The differential diagnosis included ruling out:

- Solitary drusen
- Advanced dry age-related macular degeneration (AMD)
- Wet age-related macular degeneration (AMD)
- Lamellar macular hole (LMH)
- Full-thickness macular hole (FTMH)
- Epiretinal membrane with pseudo macular hole
- Central serous retinopathy
- Vitreomacular traction syndrome
- Cystoid macular edema

The small drusen observed in the left eye are usually suggestive of the dry form of AMD. However, the lesion seen in the right eye did not present the usual yellow color of a drusen.

Sub- or intraretinal hemorrhages resulting from wet AMD are normally of a dark color rather than light grey. However, this lesion could still be some form of exudation.

LMH and FTMH, as well as wet AMD, may present with such a sudden onset. Moreover, this greyish lesion could be detached retinal tissue. However, our office is not equipped with an OCT, so it was not possible at this stage to determine precise anatomic positioning of the sensory retina.

An epiretinal membrane with pseudo macular hole was possible, although such a membrane had not been observed on previous examinations. Again, the use of an

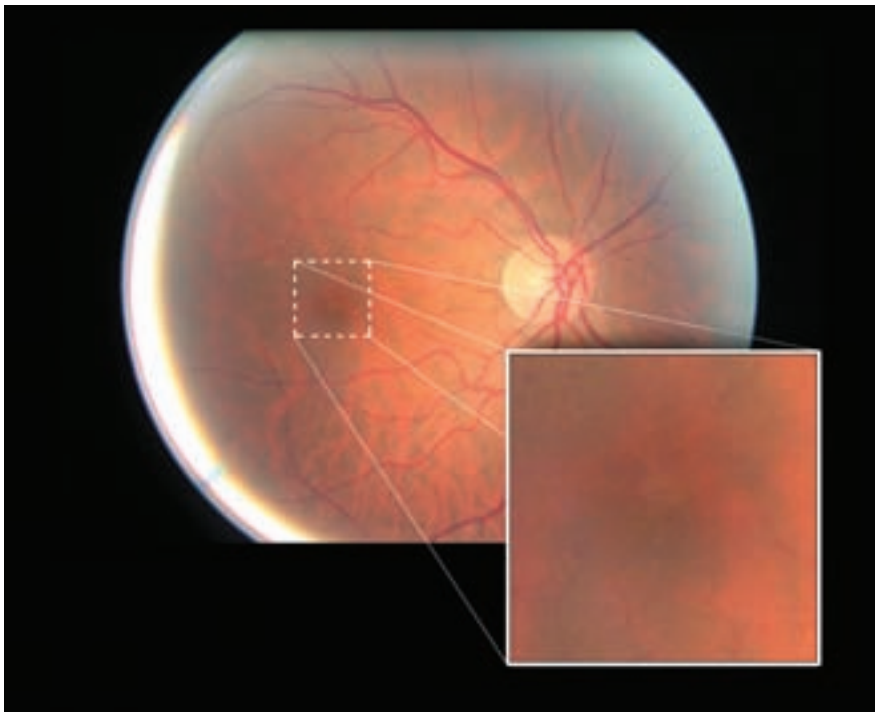


Figure 2 – *Fundus photography shows a small light grey flat lesion with diffuse border in the right eye.*

OCT would have been helpful in identifying a subtle membrane.

Vitreomacular traction syndrome and cystoid macular edema would show the presence of retinal cysts while none had been observed. An OCT examination could help to rule-out more subtle manifestations of those entities.

Central serous retinopathy was ruled out since there was no significant elevation of the macular region. Moreover, this condition typically affects males between the age of 20 and 50, but it is sometimes observed in women also, although more rarely.

Definitive diagnosis seemed to warrant the use of computerized imagery of the retina such as OCT.

The closest retinal specialist was contacted the same week, but since meeting him meant a 108 kilometre round trip for the patient, he advised referral to a local ophthalmology clinic that was equipped with an OCT.

Second emergency call

On December 7th, 2010, the patient called explaining that reading was getting worse with her right eye. She had not seen the ophthalmologist yet. She was instructed to come to the office on the same day. Upon further questioning, she said that the "dark spot" had gotten bigger and she mentioned that although it always stayed in the center, it made swinging moves up and down while reading "as if climbing a staircase".

Best-corrected distance visual acuity was now 6/45 (20/150) OD and 6/7.5-1 (20/25-1) OS. The patient's right eye was dilated. This "swinging spot" had the characteristics of a macular operculum and since no standard contact lens for fundus observation was available, this time she was examined with the central lens of the Goldmann 3-mirror lens. Suspicions of a macular hole were confirmed by the presence of a floating operculum above the macula of the right eye. Vitreous detachment was at an early stage at this time, if any, since no Weiss's ring was observed floating in the posterior chamber.

The retinal specialist was contacted the next day and an appointment was scheduled.

Visit with the retinal specialist

The patient met with the retinal specialist on January 7th, 2011. Best-corrected distance Snellen visual acuity was 6/30- (20/100-) OD and 6/6- (20/20-) OS. Fundus examination showed a lesion of the macula of the right eye and no presence of a Weiss's ring in either eye. An OCT examination was performed using the Stratus OCT™ from Zeiss (Germany) (*right eye shown on Figure 3*).

OCT for the right eye showed a full thickness macular hole with sensory retinal detachment around the hole. Infiltration of fluid through intraretinal spaces produced cystic changes around the hole. A pseudo-operculum could also be observed attached to the posterior hyaloid membrane and floating above the fovea. OCT for

the left eye showed a normal appearance of the macular region.

These observations lead the retinal specialist to the diagnosis of a stage 3 macular hole. He suggested 25-gauge pars-plana vitrectomy with air tamponade and phacoemulsification. He also informed the patient of a 1/100 chance of worse vision after the surgery and of a 1/1,000 risk of losing the eye. The patient chose to proceed with the intervention.

Surgery

On February 15th, 2011, the retinal specialist proceeded with the surgery. He used retrobulbar injection for anesthesia. He started with cataract extraction using phacoemulsification. He then performed the vitrectomy, and injected intravitreous triamcinolone acetonide (Kenalog™) before conducting a peeling of the internal limiting membrane that he had stained with infracyanine green (IFCG). Finally, fluid air exchange was performed using 20% sulphur hexafluoride (SF6). The patient was instructed to maintain a prone position for the better part of seven days. She was scheduled for a follow-up the next morning.

Next day post-op visit

On February 16th, 2011, visual acuity for the right eye was "hand motion". Slit-lamp examination showed a well-sutured wound and grade 3 cell reaction in the anterior chamber. On fundus examination, the retina was on and the gas bubble at 90% of its volume. Moxifloxacine chlorhydrate 0.5% (5 mg/mL) (Vigamox™) q.i.d., prednisolone acetate 1.0% (Pred Forte™) q.i.d. and homatropine 5.0% q.i.d. were prescribed for the right eye and a follow-up was scheduled for the following week.

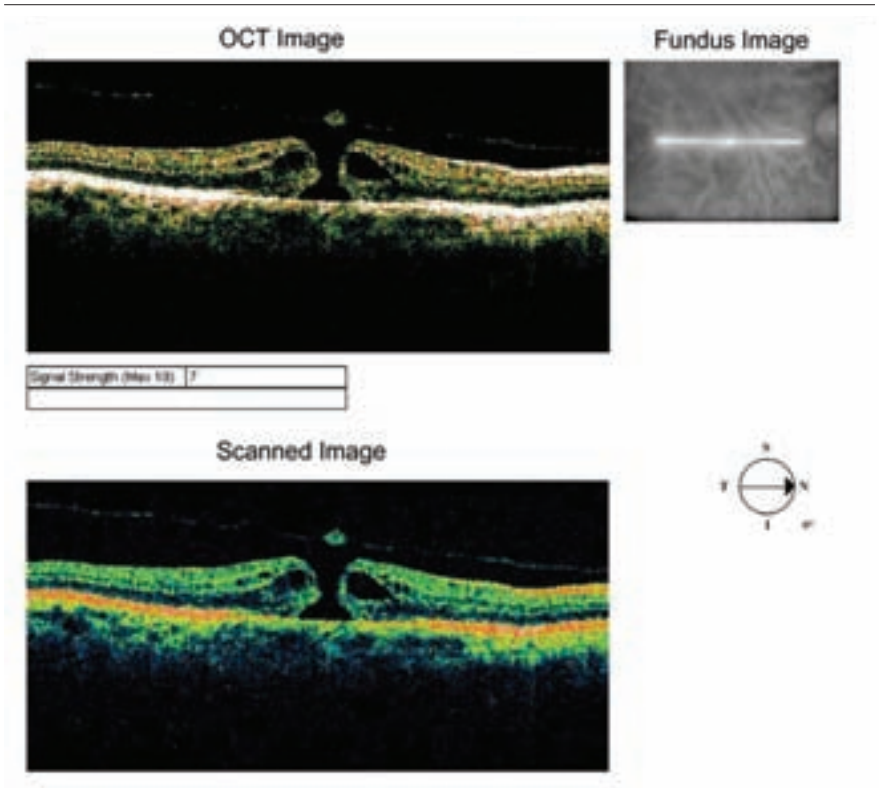


Figure 3 – *OCT shows a full thickness macular hole with pseudo-operculum and surrounding sensory retina detachment in the right eye.*

One-week post-op visit

On February 22nd, 2011, uncorrected Snellen visual acuity OD was 6/18-1 (20/60-1) and corrected visual acuity OS was 6/7.5 (20/25). Slit-lamp examination of the right eye showed a well-sutured wound and grade 1 cell reaction in the anterior chamber. Contact lens fundus examination showed a closed macular hole. The same medication was prescribed for the right eye and a follow-up was scheduled for the next month.

Five-week post-op visit

On March 25th, 2011, uncorrected Snellen visual acuity OD was 6/24+2 (20/80+2) and corrected visual acuity OS was 6/6- (20/20-). Slit-lamp examination of the right eye showed a well-sutured wound and quiet anterior chamber and the beginning of a posterior capsule opacification. Contact lens fundus examination showed a closed macular hole. OCT of the right eye portrayed a normal looking macula very similar to the OCT of the left macula (*right eye only shown on Figure 4*). Pred Forte 1.0% was

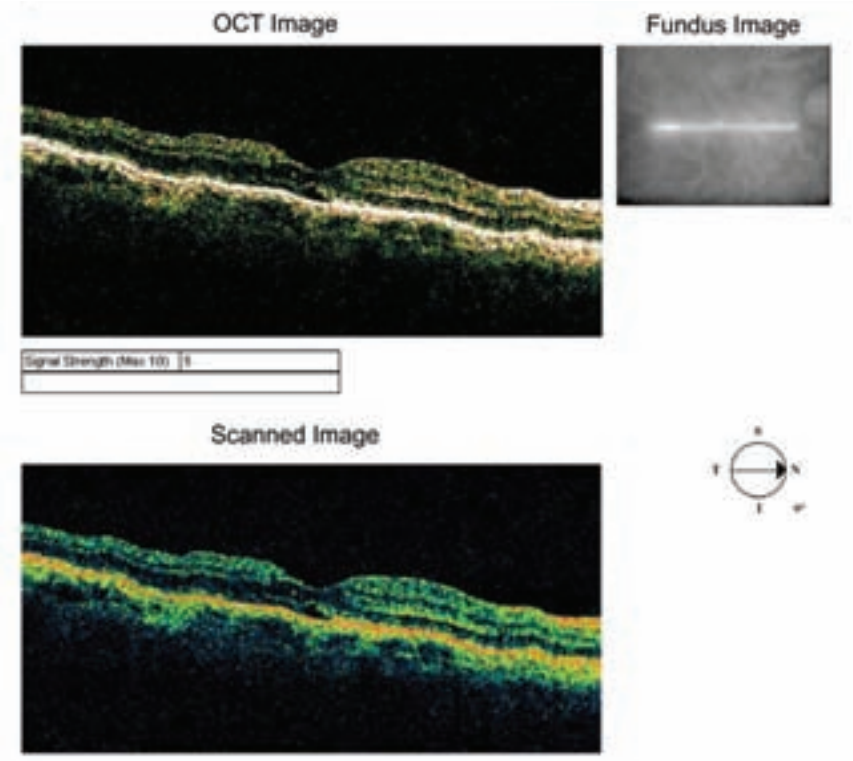


Figure 4 – *OCT of the right eye shows a closed macular hole and normalized macular structure in the right eye.*

tapered, Vigamox 0.5% (5 mg/mL) and homatropine 5% were stopped for the right eye. YAG laser capsulotomy was scheduled for the next follow-up.

Two-month post-op visit

On April 12th, 2011, uncorrected Snellen visual acuity OD was 6/12 (20/40). YAG laser capsulotomy was performed on the right eye. One drop of brimonidine tartrate 0.15% (Alphagan™) was used pre-op. Pred Forte 1.0% was prescribed q.i.d. for one week. Follow-up was scheduled in two months. The patient was advised to return to the referring optometrist for refraction.

Thirteen weeks post-op visit

On May 6th, 2011, the patient had an appointment at our clinic for refraction. She said that she was satisfied with the vision of her right eye even though it was not as good as it was before the "incident".

Prescription of the habitual pair of glasses was OD -0.50-0.25 × 090 and OS -0.50, addition +2.75 OU. Snellen distance visual acuity with this correction was 6/12 (20/40) OD and 6/6 (20/20) OS. However, the patient pointed out that the letters were "not completely formed" on their right side. Binocular reading was J2 at 40 centimeters (16 inches). Results of subjective refraction were OD -0.75-0.50 × 180 6/12+2 (20/40+2) and OS -0.75-0.25 × 100 6/6 (20/20) with +3.00 addition for 6/6 (20/20) binocular visual acuity at near. Anterior segment evaluation by slit lamp examination was within normal limits. The macula of the right eye presented a closed macular hole with well-defined borders and no sign of infiltration (*Figure 5*); the macula of the left eye (not presented on the figure) showed unchanged appearance of drusen. There was no foveal reflex in either eye.

Amsler grid testing was normal in the left eye; however, a small central metamorphopsia was noticed on the right of the fixation point in the right eye. This corresponded to the patient's reported area of distortion on the right side of the letters on the Snellen chart. Humphrey HFA-750™ (Zeiss/Humphrey instruments, Germany) macular threshold automated perimetry was performed. A very small loss of sensitivity was observed for the right eye compared with the left eye (2 to 5 dB less depending on the region tested and not statistically significant according to the instrument).

The patient was informed of the very good result of the surgery and about a potential small distortion remaining in the vision of the right eye due to the retinal tear. However, the rest of the retina was well reattached and would, in all likelihood, remain so. She was advised that a macular hole could also happen in the other eye, as bilateral onset occurs in about 10-15% of cases but it is

rarely simultaneous.[4,6] As for her glasses, it was explained to her that there was very little change in the prescription. Annual routine exams were advised, but the patient was counseled to keep careful watch over the vision of both eyes and to keep using her Amsler grid. In the case of broken or distorted lines, or sudden appearance of a dark spot in the center of the grid, she should be assessed as soon as possible.

Discussion

Age-related FTMH is a fairly rare occurrence: it is found in 3 out of 1,000 individuals[4] and affects primarily females 3:15. It is believed to be the result of an abnormally strong adherence between the posterior hyaloid membrane of the vitreous body and the central or macular part of the sensory retina. An example of this is vitreomacular syndrome where there is an incomplete separation of the vitreous from the retina with persistent macular attachment.[1] When posterior vitreous detachment occurs, the force transmitted to the surface of the macula may tear part of the retina off. Fluid from the vitreous cavity infiltrates the outer layers of the retina and detaches the photoreceptors from the retinal pigment epithelium. The resulting disorganization of the photoreceptors leads to a severe loss of visual acuity, as well as possible perception of metamorphopsia or of a central scotoma.

Etiology is mostly idiopathic. However, other risk factors include: cystoid macular edema, vitreomacular reaction, trauma, ocular surgery, myopia, laser treatment and intraocular inflammation.[5]

Traditionally, diagnosis was made through the observation of the macular area with a non-contact fundus lens (Hruby, Volk, etc.), or preferably with a contact fundus lens, which provides better resolution of fine details of retinal structures as well as better stability. A subjective assessment can also be obtained with the Watzke-Allen test. This test involves projecting a fine vertical slit on the retina, with the slit lamp and a fundus lens, and sweeping this slit laterally on the macular area. In the presence of a full thickness hole, the subject should report a break in the middle part of the slit as it passes over the hole.

More detailed observation and better identification of the different stages of the disease are obtained nowadays with the use of the OCT.[6]

Stage 1: (impending or pre-macular hole): there is a perifoveal PVD with persistent attachment of the posterior hyaloid to the foveal center. At this stage, there is loss of the foveal reflex.

- Stage 1A: the antero-posterior traction resulting from stage 1 leads to an intrafoveal cyst. This cyst can often be observed as a yellow spot.
- This stage 1A hole can evolve in three ways:
- The hyaloido-foveal attachment can break, with resolution of the cyst and return to a normal foveal configuration.
- The hyaloido-foveal attachment can break the inner wall of the intrafoveal cyst, with evolution to an inner lamellar hole.
- There can be disruption of the outer wall of the intrafoveal cyst, with evolution to a stage 1B hole – outer lamellar hole.
- A yellow ring is observed around the fovea in a stage 1B hole and is most likely due to disruption of the xanthophyll within the outer wall of the intrafoveal cyst. Visual acuity is usually around 6/7.5 (20/25) to 6/18 (20/70).

Stage 2: (full-thickness hole): there is still a perifoveal PVD with persistent attachment of the posterior hyaloid to the foveal center. The resultant antero-posterior traction leads to a full-thickness disruption of the neuroepithelium. An incomplete prefoveal operculum begins to detach, to which the posterior hyaloid is still connected. The hole is less than 400 μm diameter.

Stage 3: (full-thickness hole): the posterior hyaloid detaches from the foveal centre and so does the prefoveal operculum. However, the hyaloid remains attached outside of the macular area. The diameter of the hole is between 400 and 600 μm. Visual acuity is usually around 6/18 (20/70) to 6/120 (20/400).

Stage 4: the posterior hyaloid is detached all the way to the periphery. Visual acuity is decreased and there is an absolute central scotoma, surrounded by a relative scotoma owing to the subretinal infiltration. Visual acuity is usually

around 6/60 (20/200) to 6/120 (20/400). With time, small yellow precipitates may be seen at the bottom of the hole, deep to the retina. Cystoid retinal changes may be present at the hole margins. Unless major traction exists on a large surface of the posterior pole, as could be the case with a neovascular membrane in proliferative diabetic retinopathy for example, detachment of the sensory retina and subretinal fluid infiltration are rather limited in the case of a macular hole and visual acuity usually stabilizes around 6/60 (20/200) to 6/120 (20/400).[4]

When our patient met with the retinal specialist for the first time, the OCT revealed the presence of a full-thickness defect with a prefoveal operculum. The ophthalmologist also wrote on the patient's chart that there was no Weiss's ring in the vitreous cavity OU. He concluded that the posterior part of the vitreous was not completely detached. All this led him to the diagnosis of a stage 3 macular hole. The patient was scheduled for surgery the next month.

When the decision to operate on a full-thickness macular hole is taken, surgery is usually scheduled relatively soon. However, this is not a "same week emergency" since improvement of visual acuity has been observed on holes treated even one year after detachment.[7] A faster intervention is still believed to result in better visual recovery. That is why our patient was seen by the specialist one month after referral and was scheduled for surgery about one month later.

Retinal hole surgery is a very rewarding surgery because visual acuity can improve dramatically following the procedure. Final visual acuity of 6/12 (20/40) or better is achieved in 65% of cases.[4] This is very significant since preop acuity can be as low as 6/120 (20/400). FTMH closure rates as high as 85 to 100% have been reported.[8-11] A few years ago, such a positive visual outcome might have seemed surprising, since it was believed that some of the neuroretinal tissue had been lost in the "operculum" which floated above the macula. It is now established that this is rather a "pseudo-operculum" that consists of contracted prefoveal cortical vitreous and that no neural tissue is usually "torn off" the retina. The hole is actually a tear in the retina and when it is once again closed, the macula becomes almost whole again, though not as precisely organized as before. Hence, visual function is close to normal.

In the present case, the retina specialist chose to proceed with cataract extraction beforehand. Not only did he consider that at age 65 she already presented some degree of nuclear sclerosis, but also that many patients will develop a significant cataract in the two years following a macular hole surgery.[11] He then performed pars plana vitrectomy and peeled the inner limiting membrane to ensure that no traction remained on the macula. The efficacy of these procedures in the case of macular hole surgery has been proven in numerous studies.[12-14] Finally, although the use of short-term tamponade with SF(6) over prolonged tamponade (with C(3)F(8) or silicone oil) is still debated,[15] our surgeon elected to use the former option because it has proven more effective in his experience. Still, this remains a challenging procedure for the surgeon since the initial reattachment rate after PPV with gas tamponade ranges from 40% to 93.5%.[2] In this case, the intervention was successful and the visual outcome of 6/12+2 (20/40+2) BCVA was to the complete satisfaction of both the patient and the surgeon. However, even with positive resolution for the affected eye, the patient should monitor the other eye and have regular follow-ups since involvement of the fellow eye at five years is about 10-15%.[4,6]

When reattachment is achieved, post-op VA is often very good and it continues to improve over a period that sometimes exceeds one year after the surgery.[16] Recovery is very quick during the first month, as the tamponade dissolves. Visual acuity progresses more slowly during the following months. Evidence obtained with the OCT seemed to indicate that visual recovery is the result of reorganization of the photoreceptor layer.[17-19] The advent of spectral domain OCT facilitated the observation of this process. Instead of the scanning beam that is used in time domain OCT, in spectral domain OCT, the interference pattern between the reference and sampling beam is decomposed into a spectrum. Since each wavelength has a different focal length, different loci of the tissue under examination

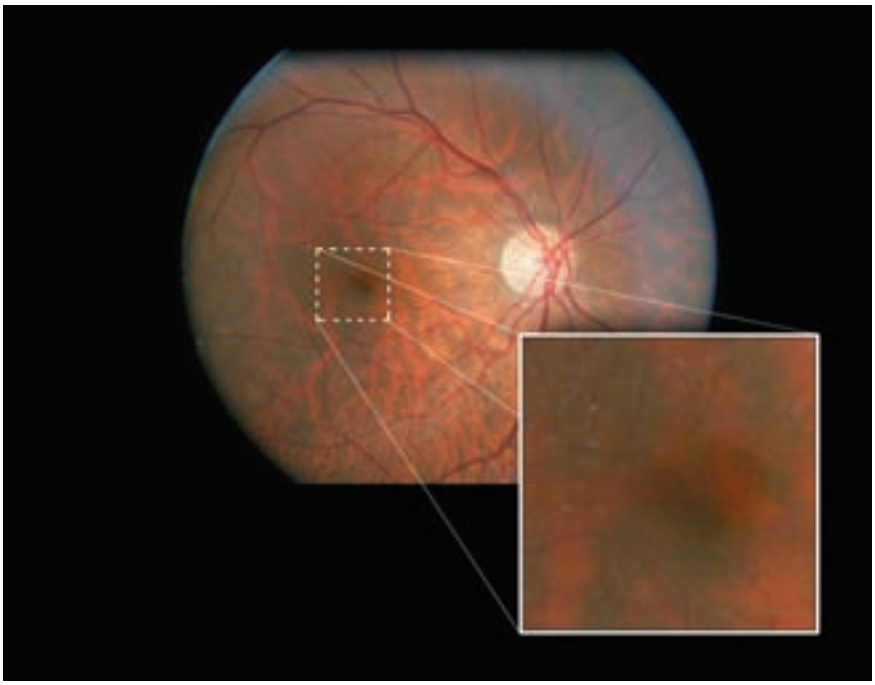


Figure 5 – *Fundus photography shows a closed macular hole with no infiltration in the right eye.*

are scanned simultaneously. This allows a sampling rate up to a 100 time faster and permits capture of details of cellular structures (up to 5 μm), which are normally blurred at the sampling speed of time domain OCT.[20,21] More recent studies that took advantage of this technology confirmed the hypothesis of photoreceptor reorganization following macular hole surgery.[22-24] The defect diameter at the junction of the inner and outer segments of the affected photoreceptors[3,24] and outer foveal thickness were the elements of OCT scans most strongly correlated with post-op BCVA.[3] Shimozono et al. (2010) hypothesized that there is an elongation of the outer segment of the photoreceptors when they are reattached, which would account for increased outer retinal thickness.[3]

Conclusion

Early identification of a full thickness macular hole is not always straightforward for clinicians who are not regularly exposed to the condition. For the patient, visual acuity is very significantly reduced and there may be a small central absolute scotoma. Traditionally, diagnosis was made after careful examination of the macular region with the slit lamp and a fundus lens, and was subjectively confirmed by the Watzke-Allen sign. This required a lot of skill from the examiner. However, new technologies such as OCT greatly facilitate the differential diagnosis with other macular conditions. The interventions needed (Pars plana vitrectomy, peeling of the inner limiting membrane and gas tamponade) all require a very skilled surgeon, but when they are successful, visual recovery is often dramatic even if the intervention is performed many months after the formation of the hole. In this regard, a macular hole is not a "same week" ocular emergency. However, as seen in this case, having facilitated access to retinal services may lead to adequately prompt referral. This in turn is reassuring for the patient who, despite being given the proper information about his condition, may fear total loss of vision in the affected eye.

References

1. Odrobina D, Michalewska Z, Michalewski J, Dziegielewski K, Nawrocki J. Long-term evaluation of vitreomacular traction disorder in spectral-domain optical coherence tomography. Retina 2011;31(2):324-31.
2. Hong MC, Wu TT, Sheu SJ. Primary gas tamponade in the management of macular hole with retinal detachment in highly myopic eyes. J Chin Med Assoc 2011;74(3):121-4. Epub 2011 Feb 25.
3. Shimozono M, Oishi A, Hata M, Kurimoto Y. Restoration of the photoreceptor outer segment and visual outcomes after macular hole closure: spectral-domain optical coherence tomography analysis. Graefes Arch Clin Exp Ophthalmol 2011 Apr 17. [Epub ahead of print]
4. Kanski JJ. Clinical Ophthalmology: A Systematic Approach. 6th Ed. Philadelphia, PA: Butterworth-Heinemann; 2003:645-647.
5. Friedman NJ, Kaiser PK, Pineda II R. The Massachusetts Eye and Ear Infirmary Illustrated Manual of Ophthalmology. 3rd Ed. USA: Saunders; 2009:385-388.

6. Spiritus A, Dralands L, Stalmans P, Stalmans I, Spileers W. OCT study of fellow eyes of macular holes. Bull Soc Belge Ophtalmol 2000;275:81-4.
7. Kim NM, Park HJ, Koo GH, Lee JE, Oum BS. Photoreceptor layer assessed in tissue layer imaging using spectral-domain optical coherence tomography after surgical closure of macular hole. Retina. 2011 Feb 23. [Epub ahead of print].
8. Benson WE, Cruickshanks KC, Fong DS, Williams GA, Bloome MA, Frambach DA, Kreiger AE, Murphy RP. Surgical management of macular holes: a report by the American Academy of Ophthalmology. Ophthalmology 2001;108(7):1328-35.
9. Tognetto D, Grandin R, Sanguinetti G, Minutola D, Di Nicola M, Di Mascio R, Ravalico G. Internal limiting membrane removal during macular hole surgery: results of a multicenter retrospective study. Ophthalmology 2006;113(8):1401-10.
10. Mester V, Kuhn F. Internal limiting membrane removal in the management of full-thickness macular holes. Am J Ophthalmol 2000;129(6):769-77.
11. Lahey JM, Francis RR, Fong DS, Kearney JJ, Tanaka S. Combining phacoemulsification with vitrectomy for treatment of macular holes. Br J Ophthalmol 2002;86(8):876-8.
12. Uemoto R, Yamamoto S, Tsukahara I, Takeuchi S. Efficacy of internal limiting membrane removal for retinal detachments resulting from a myopic macular hole. Retina 2004;24(4):560-6.
13. Mochizuki Y, Enaida H, Hisatomi T, Hata Y, Miura M, Arita R, Kawahara S, Kita T, Ueno A, Ishibashi T. The internal limiting membrane peeling with brilliant blue G staining for retinal detachment due to macular hole in high myopia. Br J Ophthalmol 2008;92(7):1009.
14. Kwok AK, Lai TY. Internal limiting membrane removal in macular hole surgery for severely myopic eyes: a case-control study. Br J Ophthalmol 2003;87(7):885-9.
15. Georgalas I, Ladas I, Petrou P, Gotzaridis E, Papaconstantinou D, Rouvas A, Koutsandrea C. Does sulfur-hexafluoride tamponade, as an adjunct to vitrectomy and internal-limiting-membrane peeling, suffice for the treatment of retinal detachment associated with macular hole? Cutan Ocul Toxicol 2010;29(4):288-92. Epub 2010 Sep 22.
16. Leonard RE 2nd, Smiddy WE, Flynn HW Jr, Feuer W. Long-term visual outcomes in patients with successful macular hole surgery. Ophthalmology 1997;104(10):1648-52.
17. Lee JE, Lee SU, Jea SY, et al. Reorganization of photoreceptor layer on optical coherence tomography concurrent with visual improvement after macular hole surgery. Korean J Ophthalmol 2008;22:137–142.
18. Villate N, Lee JE, Venkatraman A, Smiddy WE. Photoreceptor layer features in eyes with closed macular holes: optical coherence tomography findings and correlation with visual outcomes. Am J Ophthalmol 2005;139:280–289.
19. Baba T, Yamamoto S, Arai M, Arai E, Sugawara T, Mitamura Y, Mizunoya. Correlation of visual recovery and presence of photoreceptor inner/outer segment junction in optical coherence images after successful macular hole repair. Retina. 2008;28(3):453-8.
20. Drexler W, Sattmann H, Hermann B, Ko TH, Stur M, Unterhuber A, Scholda C, Findl O, Wirtitsch M, Fujimoto JG, Fercher AF. Enhanced visualization of macular pathology with the use of ultrahigh-resolution optical coherence tomography. Arch Ophthalmol 2003;121(5):695-706.
21. Ko TH, Fujimoto JG, Schuman JS, Paunescu LA, Kowalevicz AM, Hartl I, Drexler W, Wollstein G, Ishikawa H, Duker JS (2005) Comparison of ultrahigh- and standard-resolution optical coherence tomography for imaging macular pathology. Ophthalmology 112:1922.
22. Inoue M, Watanabe Y, Arakawa A, et al. Spectral-domain optical coherence tomography images of inner/outer segment junctions and macular hole surgery outcomes. Graefes Arch Clin Exp Ophthalmol 2009;247:325–330.
23. Christensen UC, Kroyer K, Sander B, et al. Prognostic significance of delayed structural recovery after macular hole surgery. Ophthalmology 2009;116:2430–2436.
24. Sano M, Shimoda Y, Hashimoto H, Kishi S. Restored photoreceptor outer segment and visual recovery after macular hole closure. Am J Ophthalmol 2009;147:313–318.

Canadian research contributions to low vision rehabilitation: A quantitative systematic review

BY WALTER WITTICH, PhD, FAAO, CLTV,[1] ; LINDSEY SIKORA, MISt,[2,] DONALD H. WATANABE, M.Sc.,[3] MARIA MARTINEZ [4]

1 *Centre de recherche institut universitaire de gériatrie de Montréal, MAB-Mackay Rehabilitation Centre - CRIR, Montréal, Québec, Canada.*
2 *McGill University, Montréal, Québec, Canada*
3 *MAB-Mackay Rehabilitation Centre - CRIR, Montréal, Québec, Canada*
4 *Université de Montréal, Montréal, Québec, Canada*

The field of low vision rehabilitation developed out of the need for rehabilitation services for partially sighted individuals whose requirements differed from those who were blind.[1] Since its development was practice-driven, research in this area initially developed in a more responsive fashion, addressing questions that emerged from the clinic. Therefore, clinical practice had been leading the development of the field of low vision rehabilitation (LVR) and research followed. More recently, research concerning LVR has taken a more balanced position whereby both clinical practice and research findings inform and guide each other, advancing the field in the tradition of evidence-based practice.[2] This advancement includes professionals in ophthalmology, optometry, low vision therapy, psychology, nursing, orientation and mobility, and rehabilitation teaching, to name a few.

CONTRIBUTIONS DE LA RECHERCHE CANADIENNE À LA RÉADAPTATION DE LA BASSE VISION : UN EXAMEN SYSTÉMATIQUE QUANTITATIF

RÉSUMÉ

Objet : La recherche sur la réadaptation de la basse vision est un domaine à croissance rapide en partie à cause d'une demande accrue de services adaptés à des adultes vieillissants affectés d'une perte de vision associée à l'âge. Diverses professions collaborent à de tels services de réadaptation, cependant, on ne sait trop quelle profession prend les devants pour repousser les limites de la recherche sur la réadaptation de la basse vision. Un récent article de synthèse a indiqué que c'était les médecins qui jouaient ce rôle au Canada. La présente étude a été menée pour reproduire ces résultats dans le cadre d'un examen systématique.

Méthode : Une recherche dans sept banques de données et une recherche manuelle dans quatre journaux sur la réadaptation de la vision ont permis de retracer des articles sur la réadaptation de la basse vision dont le premier auteur était affilié à un établissement canadien. On a totalisé les données sur les titres professionnels, la provenance du financement et le contenu de l'étude.

Résultats : Des 1 870 références, on a extrait les données de 215 articles pertinents. Les quatre principaux titres des auteurs étaient : optométristes (avec ou sans doctorat; 56 communications – 26,0 %); chercheurs avec doctorat seulement (48 communications – 22,3 %); chercheurs avec maîtrise (43 communications – 20,0 %); et docteurs en médecine (avec ou sans doctorat; 39 communications – 18,1 %). Les journaux spécialisés en réadaptation de la vision ont publié 38 % de toutes les communications, suivis des journaux en ophtalmologie (27 %) et en optométrie (22 %). Les publications des 11 dernières années ont représenté plus de 50 % de toutes les communications produites dans ce domaine au Canada pendant les 64 années d'existence des publications, dont 70 % proviennent des universités.

Conclusion : Les résultats reflètent la mosaïque de la recherche sur la réadaptation de la basse vision au Canada et mettent en évidence la collaboration qui s'est installée entre les chercheurs, les cliniciens, les sources de financement et les organismes de réadaptation. Étant donné sa nature pluridisciplinaire, la recherche sur la réadaptation de la basse vision semble s'appuyer sur la collaboration entre les professions.

ABSTRACT

Purpose: Low vision rehabilitation research is a quickly growing area, due in part to the increase in the demand for services geared at older adults with age-related vision loss. Various professions collaborate to provide such rehabilitation services; however, it is currently unclear which profession takes the leading role in advancing the frontiers of low vision rehabilitation research. A recent review article proposed that in Canada, this role is held by physicians. The present study was conducted to replicate these findings under conditions of a systematic review.

Method: A search of seven databases and a hand-search of four vision rehabilitation journals identified articles on low vision rehabilitation whose first author had an affiliation at a Canadian institution. Data on professional credentials, funding source, and study content was tabulated.

Results: Of the 1,870 references, data from 215 eligible articles were extracted. The top four author credentials were optometrists (with or without PhD; 56 papers, 26.0%), followed by researchers with PhDs only (48 papers, 22.3%), researchers with master's degrees (43 papers, 20.0%), and medical doctors (with or without PhD; 39 papers, 18.1%). Vision rehabilitation journals published 38 per cent of all papers, followed by ophthalmology (27%) and optometry journals (22%). Publications in the past 11 years amounted to over 50 per cent of the output over the 64-year publication history in this field in Canada, 70 per cent of which were based in universities.

Conclusion: The results reflect the mosaic structure of low vision rehabilitation research in Canada, highlighting collaborations among researchers, clinicians, funding sources and rehabilitation agencies. Given its multidisciplinary nature, low vision rehabilitation research seems to be driven by collaboration among the professions.

Key words: *review, systematic, vision, low vision rehabilitation, activity, research, Canada, ophthalmology, optometry*

A publication by Teichman and Markowitz[3] recently suggested that, with research conducted in Canada, most resulting publications in LVR had first or corresponding authors with a medical degree (MD) (48.1%) who published in ophthalmology journals (44.3%). Based on their review of the literature, the authors proposed that even though optometrists have a more longstanding history in providing LVR services, the medical profession seems to play a leading role when it comes to research publication in LVR. These findings were called into question by optometrists due to some methodological and categorization issues[4] and sparked continued discussion.[5] Since such a leadership role would be of great importance for questions of research funding and policy development, the question of LVR research in Canada should be revisited. We decided, however, that it might be easier to address this topic if the investigators involved are neither working in, nor affiliated with, optometry or ophthalmology, but work within a rehabilitation research setting itself. In collaboration with a professional librarian, we decided to replicate the study by Teichman and Markowitz[3] and address the previously raised concerns[4] as well as applying methodological standards for systematic reviews[6], thereby following the encouragement of Markowitz[5] himself to replicate his findings.

Method

The following databases were accessed during the electronic component of the systematic review: Cochrane, Medline via OVID, Medline via OVID in Process, Embase, AMED, Web of Science, and CINAHL. The search included articles published on or before December 14, 2010. There were no language exclusion criteria and all studies were either in English or French. The search terms were based on the search initially used by Teichman and Markowitz[3], with minor additions but no deletions. For those databases where the author country was 'coded', a filter was utilized to reduce the number of results accordingly. In addition, we searched three low vision-specific journals electronically, that are not entirely coded within these databases (Visual Impairment Research, Journal of Visual Impairment and Blindness/JVIB 2000-2010, AER Journal). Furthermore, we hand-searched four peer-reviewed journals that are not completely available electronically (Canadian Journal of Optometry (CJOpto), Canadian Journal of Ophthalmology (CJOpth), New Outlook for the Blind, Re:View). Finally, we contacted Teichman and Markowitz for a list of their included studies. Based on their

most frequently listed authors, we contacted the six most-cited researchers in Canada in order to obtain a copy of their CVs. Any additional references were then added to the total list and entered into an EndNote file for processing (n = 1870).

The initial elimination process consisted of a scan by one reviewer (Walter Wittich) of titles and abstracts alone in order to eliminate all references that were obviously not related to low vision or rehabilitation. This reduced the EndNote file to 434 references. The second review of titles, abstracts and texts (if necessary) was conducted by two reviewers (Donald H. Watanabe and Walter Wittich). The inclusion criteria reported by Teichman and Markowitz[3] were generally adopted for the present review, however, a more detailed definition of the exclusion criteria was required because it was decided that these parameters could be improved. Research articles that focused on functional vision and visual function deficits and their measurement in general (not in the context of low vision) were excluded from the review (i.e. papers on visual perimetry, colour vision or acuity measurement). In addition, topics such as aging, blind sight, amblyopia, cataract, and cortical reorganization in the blind were also excluded, since they do not directly relate to the rehabilitation process. It was decided that the first author must have an affiliation at a Canadian institution or organization at the time of publication (this differs slightly from Teichman and Markowitz who state that the work also had to be conducted at a Canadian institution). When applying these standards to the publication list provided by Teichman and Markowitz, 73 papers from their review were excluded.

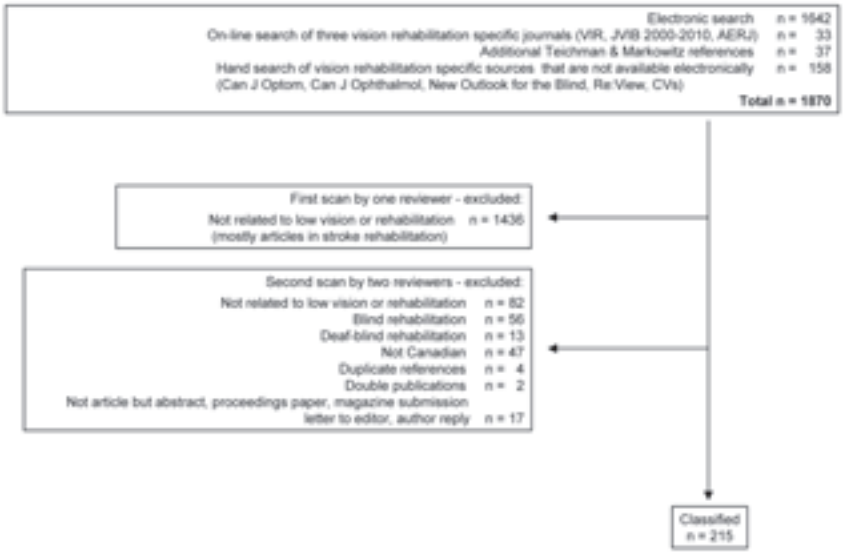


Figure 1 – *Systematic literature review process and classification results.*

In order to further facilitate the evaluation, additional limits and clarifications were established, which regulated the exclusion of studies focused on blind rehabilitation, braille in the context of blind rehabilitation, cane travel, and orientation and mobility skills of blind individuals, dual sensory impairment, and basic science that had indirect relevance to low vision rehabilitation. The driving question behind the development of these criteria was whether each examined paper intended to improve or inform any aspect of low vision rehabilitation in the applied context. Finally, the publication by Teichman and Markowitz itself was excluded.

Results

Figure 1 demonstrates how the 1,870 references were classified and by which criteria they were excluded. The 215 articles that were included in the final classification were obtained through the library resources of McGill University, the Université de Montréal or through interlibrary loan. The majority of the first authors who published low vision rehabilitation research articles included optometrists (with or without PhDs) who wrote 56 of the 215 papers (26.0%), followed by researchers with PhDs only (48 papers, 22.3%), medical doctors (with or without PhDs; 39 papers, 18.1%), researchers with master's degrees (43 papers, 20.0%), bachelor's degrees (19 papers, 8.8%) and those of unknown background (10 papers, 4.0%; see *Figure 2*). Most of the research was conducted at

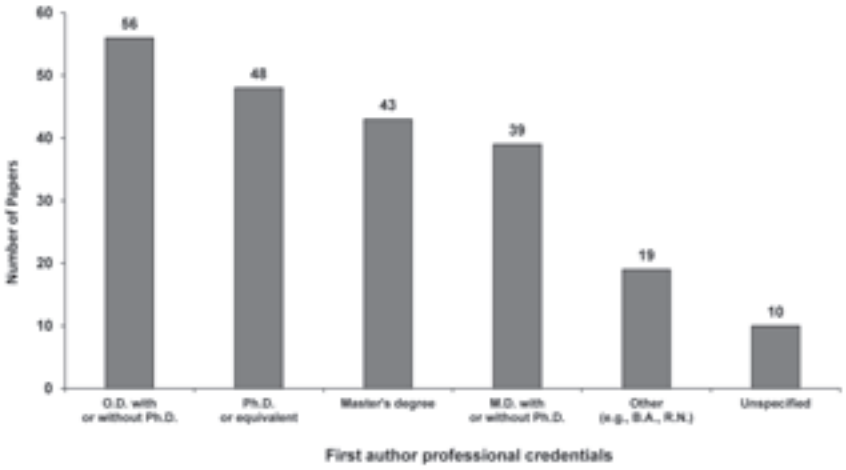


Figure 2 – *Frequency of publications as a function of the professional credentials of the first author. OD = Doctor of Optometry, PhD = Doctor of Philosophy, MD = Doctor of Medicine, BA = Bachelor of Arts, RN = Registered Nurse*

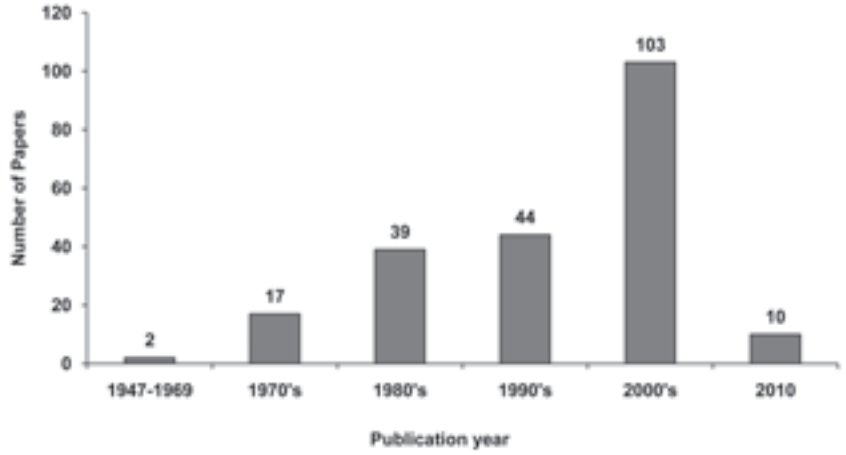


Figure 3 – *Number of publications by Canadian first authors in low vision rehabilitation as a function of publication year.*

the University of Waterloo (39 papers, 18.1%), University of Toronto (20 papers, 9.3%), Université de Montréal (15 papers, 6.9%), and the University of British Columbia (14 papers, 6.5%). Other Canadian universities (63 papers, 29.3%), low vision rehabilitation centres (26 papers, 12.1%), and hospital-based research units (15 papers, 7.0%) comprised the remainder of the institutions. Given the institutional distribution, it was not surprising that researchers in the Province of Ontario generated the majority of papers (118 papers, 54.9%), followed by Quebec (55 papers, 25.6%), British Columbia (22 papers, 10.2%), the atlantic provinces (10 papers, 4.7%), and the Prairies (9 papers, 4.2%). Of the 155 papers (72.1%) that originated from departments within universities, those from optometry (50 papers, 32.3%), ophthalmology (35 papers, 22.6%), psychology (22 papers, 14.2%), and other departments such as engineering (19 papers, 12.3%), and rehabilitation (11 papers, 7.1%) were the most represented.

The articles were published in vision rehabilitation journals (82 papers, 38.0%), ophthalmology journals (58 papers, 26.9%), optometry journals (47 papers, 21.8%), and other publications (29 papers, 13.4%). The journal with the most publications was JVIB (50), followed by CJOph (45), CJOpto (20) and OVS (10). English was the most common language of publication (208 articles), followed by French (7). Publication dates ranged from 1947 to 2010. The exponential-like growth of research in low vision rehabilitation is shown in *Figure 3* where the number of research articles published in the past 11 years (2000 through 2010) is over 50 per cent of the output over the 64-year publication history in this field in Canada. Among the 83 articles (38.6%) that stated their funding source(s), the majority of the research was funded by research consortiums and collaborations among hospitals, universities and private sources (31.1%). The remaining sources included Canadian federal and provincial

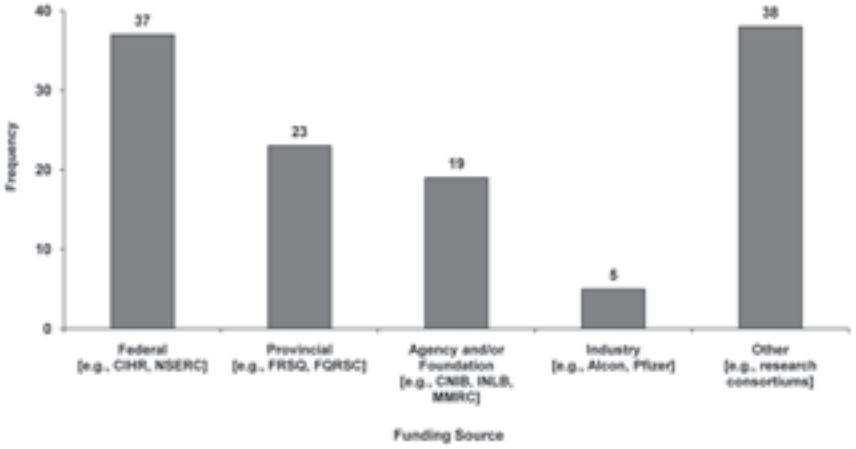


Figure 4 – *Number of publications as a function of their funding source. CIHR = Canadian Institutes of Health Research, NSERC = Natural Sciences and Engineering Research Council of Canada, FRSQ = Fonds de recherche en santé du Quebec, FQRSC = Fonds de recherche sur la société et la culture, CNIB = Canadian National Institute for the Blind, MMRC = MAB-Mackay Rehabilitation Centre, INLB = Institut Nazareth et Louis-Braille*

granting agencies, rehabilitation agencies as well as industry (*Figure 4*). Given that many projects had more than one funding source supporting their research efforts, the number of sources exceeds the number of articles aforementioned. Further, the majority (132 articles, 61.4%) did not specify their funding source(s).

The 215 articles that were included in the final classification were categorized into 12 different fields of research interest, with many of the papers addressing more than one topic area (see *Table 1*). Research concerning service delivery, psychosocial effects of visual impairment, applied optics/assistive technology and review articles accounted for 50.6 per cent of all papers. For those

Table 1: Topic area categories

MANUSCRIPT TOPIC AREA	Number	%
Service delivery – Models, program evaluation, information access, awareness	56	18.6
Review – LV-related diseases, treatment effectiveness, topic summaries (e.g., binocular vision)	44	14.6
Psychosocial – Coping, self-concept, social participation, treatment satisfaction	35	11.6
Applied optics and psychophysics, assistive technology/low vision aids	34	11.3
Assessment – Development/validation of questionnaires, clinical and functional tests	30	10.0
Visual function and functional vision – Acuity, useful field of vision, activities of daily living (e.g., reading labels)	23	7.7
Policy – Advocacy, recommendations to meet projected service demands	17	5.7
Epidemiology – Demographics, prevalence and etiology, risk factors	16	5.3
Other – Comorbid impairments, driving, employment, utility	16	5.3
Public health – Patterns of referral and compliance, disparities in awareness	13	4.3
Case study	10	3.3
Education – comparing teaching curricula, improving academic skills, mainstreaming school-aged children, role of paraprofessionals	7	2.3

studies that recruited participants (n = 131, 60.9%), the majority of publications focused on seniors age 65 and over (n = 54, 41.2%), whereas 51 papers dealt with life span issues, 15 reported on findings in children and youth age 0-21, and 11 publications did not specify participants age.

Discussion

The purpose of this systematic review was to replicate the study by Teichman and Markowitz[3] under conditions of a systematic literature review. As pointed out by Teichman and Markowitz, LVR is a classic example for multidisciplinary collaboration, and this reality is reflected in the large variety of professions that publish in this area of research in a large variety of journals. Contrary to their findings that pointed to physicians being the largest group of research authors in LVR, the present data, under conditions of a systematic literature review, indicate that PhDs form the largest group of lead authors in this field (with or without a clinical degree). This would make intuitive sense since one of the professional goals of academics is to conduct and publish research, whereas the primary mandate of clinicians is to evaluate, treat and refer patients. The exception here may be clinician-scientists who hold both an academic and a professional degree, such as MD, PhD and OD PhDs, and who combine both their clinical and research efforts. Of particular interest is the group of authors with master's and bachelor's degrees only, many of whom represent professionals who also hold concurrent clinical degrees in areas such as occupational therapy, nursing or low vision rehabilitation, and who provide direct rehabilitation services to individuals with low vision. Their representation as first authors of research papers is considerable, given that it is an unlikely part of their clinical service delivery mandate to conduct and publish research, both time-consuming activities for a clinician. The group of master's degree authors also includes doctoral students who published components of their graduate work. This group is very small and this may be an indicator of how few students pursue graduate training in fields related to LVR. Given the projected demographic changes in developed countries and the associated impending retirement of professionals over the coming decades, this is a worrisome statistic and has previously been discussed in more detail.[7,8] It is the responsibility of current professionals to recruit, train and inspire the next generation of LVR researchers. Should we fail in this task, the future of LVR research could be bleak.

In concurrence with Teichman and Markowitz's results[3], this review found that the large majority of research (70.1%) was conducted in university settings. Given the involvement of academics and the distribution of universities across Canada, it was not surprising that Ontario and Quebec were the source of over 80 per cent of the published papers. Close to one-third of publications originated within the two schools of optometry. However, a closer look at the actual authors revealed that the most prolific author/co-author among the 215 studies was an ophthalmologist (n = 22 studies), followed by an experimental psychologist (n = 21), an OD (n = 17) and three OD PhDs (n = 17, 16 and 13).

Given the historical origins of LVR research, it is not surprising that a large number of research articles were published in journals such as JVIB that are geared towards rehabilitation professionals. The choice of publication venue may be driven by impact factor for academics, whereas publishing in clinician journals may be more likely to distribute research findings among those who are most likely to implement the results, thereby having the highest clinical impact. From the perspective of improving clinical practice, this is good news because the ability of knowledge transfer from research into practice is thereby facilitated. Here is also where the effect of the hand search during the systematic review became apparent. Practitioners' journals are less likely to have a quantifiable impact factor and are rarely indexed in library databases or electronically available, specifically for issues before the year 2000. However, those journals contributed 158 citations (69.8%) of the overall search results.

The large increase in publications over the last decade is promising. Given that LVR research is still a young area of investigation, much remains to be done. In order to make these research endeavours

feasible, however, funding will play an important role. The fact that 61.4 per cent of studies did not acknowledge any source of funding may be rooted in the reality that many studies in this field are simply not funded but are conducted by dedicated individuals, teams and institutions that are trying to find answers to clinically relevant questions. It is possible that some journals do not specifically ask for funding information, however, the funding agencies generally request that their contribution be acknowledged in resulting publications, and such credit usually improves the chances for future funding. It was surprising that of the funded studies, research consortiums (e.g. collaborations of private, hospital and/or university organizations) carried the largest financial load, supporting one-third of all papers. In many cases, small practice-based studies were funded by endowments or foundations based on a specific project. Federal and provincial governments provided support for 30 per cent and 19 per cent respectively, while industry funding was minimal, at 4.1 per cent. At the federal and provincial funding agency level, the field of LVR still has to improve its competitive edge and demonstrate its place among the health priorities.

The analysis of the publication content indicated that the main research priority was on service delivery (e.g. delivery models, employment and education strategies, information access, awareness). This makes intuitive sense, given the number of studies funded by agencies that may want to strategically streamline their services and become as efficient and effective as possible. The second-largest category was review papers, most of which were intended to inform clinicians as well as researchers about the current state of knowledge in the field. It should be noted that review papers rarely require extensive funding, making them more feasible in underfunded research areas. Publications on the psychosocial impact of low vision ranked third, dealing with common topics such as depression, coping strategies, anxiety, and life satisfaction. Intuitively, these studies are of interest for various stakeholders, given that the state of mind of the clientele greatly influences their perception of service delivery and uptake. The fourth-largest group of publications dealt with low vision-specific applied domains such as optics, psychophysical measurement of residual visual function and assistive technology. As pointed out by Teichman and Markowitz, the group of papers on assessment tools was small, at only 10 per cent, given that this area is of great importance for the field of low vision. The development and proper application of appropriate outcome measures in low vision research will determine how our domain is evaluated and compared to other rehabilitation fields.[9]

It is likely that the present data underestimate the contribution of any specific profession. In the case of LVR research in Canada, hosting the 9th International Conference on Low Vision – Vision 2008 in Montreal[10], or the fact that the editor-in-chief of the journal *Insight: Research and Practice in Visual Impairment and Blindness* is a Canadian[11] are not truly quantifiable. In addition, this systematic review does not include the grey literature, thereby neglecting non-peer-reviewed contributions. For example, Canada contributed 19 proceedings papers to Vision 2005 in London, England, and 54 papers to the proceedings of Vision 2008, of which 11 were published in French. None of these contributions are accounted for in this review. In addition, there are several methodological limitations and differences between this study and the one conducted by Teichman and Markowitz. The choice to limit the inclusion criteria in both studies to papers by first authors with an affiliation at a Canadian institution may have excluded papers by non-Canadians who conducted research within Canada or Canadians who conducted their work outside of the country. Additionally, the summary of author affiliations in this study was based on the first author whereas Teichman and Markowitz sorted their data by the corresponding author. The differences could in part be accounted for by laboratory leaders or supervisors (corresponding) versus students (first authors in case of supervised work), however, this difference is unlikely to affect the affiliations. Furthermore, the present study refined and limited the inclusion topics more strictly than the paper by Teichman and Markowitz. For example, studies that evaluated or developed measures also used in

low vision (such as visual field perimetry) when the manuscript did not include a low vision population, were excluded.

A general limitation of this study as well as the work by Teichman and Markowitz is that the quantitative evaluation of the number of publications is used as a proxy for estimating the leadership role in low vision rehabilitation research. This is, however, unlikely to be the case since quality has not been assessed. In order to bring more clarity to this question, a more traditional approach to systematic reviews, such as the one used by Jutai et al.[12] should be applied (this is currently under preparation). Such a study could focus on a detailed evaluation of research contributions, design quality, clinical relevance, as well as impact factors and citation frequency. What is clear, however, is that for LVR research to truly blossom and improve rehabilitation services, a collaborative spirit is required in which all rehabilitation-related professions work together in order to improve services for the visually impaired. Given what is known about the "demographic tsunami"[13]of older adults with vision loss the rehabilitation professions will be facing over the coming decades, it is only as a team that we will be able to provide the quality and type of services that will be required.

References

1. Goodrich GL, Arditi A, Rubin G, Keeffe J, Legge GE. The low vision timeline: An interactive history. Visual Impairment Research. 2008;10(2-3):67-75.
2. Binns AM, Bunce C, Dickinson C, Harper R, Tudor-Edwards R, Woodhouse M, et al. How effective is low vision service provision? A systematic review. Surv Ophthalmol. 2012;57(1):34-65. Epub 2011/10/25.
3. Teichman JC, Markowitz SN. Canadian research contributions to low-vision rehabilitation. Canadian Journal of Ophthalmology. 2008;43(4):414-8.
4. Leat SJ, Hrynchak PK. Canadian research contributions to low-vision rehabilitation. Canadian Journal of Ophthalmology. 2009;44(4):464.
5. Markowitz SN. Canadian research contributions to low-vision rehabilitation - Author reply. Canadian Journal of Ophthalmology. 2009;44 (4):464.
6. Pai M, McCulloch M, Gorman JD, Pai N, Enanoria W, Kennedy G, et al. Systematic reviews and meta-analyses: An illustrated, step-by-step guide. The National Medical Journal of India. 2004;17(2):86-95.
7. Corn AL, Spungin SJ. Graduates and current students in leadership programs in visual impairment. Journal of Visual Impairment & Blindness. 2002;96(10):736-40.
8. Silberman RK, Ambrose-Zaken G, Corn AL, Trief E. Profile of personnel preparation programs in visual impairments and their faculty: A status report. Journal of Visual Impairment & Blindness. 2004;98(12):755-69.
9. Massof RW. Moving toward scientific measurements of quality of life. Ophthalmic Epidemiol. 2008;15(4): 209-11.
10. Gresset J, Overbury O. An invitation to Montreal! The 9th International Conference on Low Vision Rehabilitation: Vision 2008 July 7-10 2008. Canadian Journal of Ophthalmology. 2006;41:389-90.
11. Gold D. New journal...Fresh Approach. AER Journal: Research and Practice in Visual Impairment and Blindness. 2008;1(1):1-2.
12. Jutai J, Strong JG, Russel-Minda E. Effectiveness of Assistive Technologies for Low Vision Rehabilitation: A Systematic Review. Journal of Visual Impairment and Blindness. 2009;103(4):210-22.
13. Gordon KD. The "demographic tsunami": How demographic and epidemiologic projections can prepare us for the provision of vision rehabilitation services to the baby boomer generation. AER Journal. 2009;2(1):2-5.

Acknowledgements

Postdoctoral fellowship funding for Walter Wittich provided by the Canadian Institutes of Health Research (CIHR – MFE # 104424).

The authors would like to thank Dr. Olga Overbury for her contribution to this manuscript.

CASE REPORT

One optometrist's personal experience with age-related macular degeneration (AMD) and nutritional supplementation

BY STUART RICHER, OD, PhD[1] &
ALBERT S LICUP, OD[2] &
TERE PORTER, OD[3] &
FREDERICK COLLISON, OD[4]

Introduction

As a result of recent findings from the National Eye Institute's Age-Related Eye Disease Study (AREDS) and the Veterans Lutein Antioxidant Supplementation Trial (LAST) Study, interventions for patients with atrophic age-related macular degeneration now include recommendations for dietary supplements in an effort to slow, halt or reverse the disease's progression. The AREDS formulation consists of 500mg vitamin C, 400IU vitamin E, 80mg zinc, 2mg copper and 15,000IU beta-carotene.[1] LAST participants received 10mg lutein daily, or 10mg lutein plus a broad-spectrum formulation of antioxidants, vitamins and minerals.[2] AREDS and LAST formulations both decreased the vision loss in patients with moderate and severe AMD, although long-term risk reduction with lutein could not be evaluated due to the small sample size and short timeframe of the LAST study. Intervention with lutein in LAST also led to improved vision in patients with mild, moderate and severe forms of AMD, presumably by increasing macular pigment optical density (MPOD).[2] More recent studies demonstrate the utility of lutein and zeaxanthin supplementation in the fight against atrophic AMD, using such methods as mfERG,[3] fundus autofluorescence,[4] and heterochromatic flicker photometry.[5] The Zeaxanthin and Visual Function Study compared lutein to zeaxanthin, to lutein plus zeaxanthin supplementation using kinetic visual fields, foveal shape discrimination and heterochromatic flicker photometry.[6]

1 *Director, Ocular Preventive Medicine-Eye Clinic, DVA Medical Center North Chicago, IL*

2 *Staff Optometrist, Naval Health Clinic Great Lakes, Great Lakes, IL*

3 *Optometrist, Norway, ME*

4 *Optometrist, The Chicago Lighthouse for People Who Are Blind or Visually Impaired, Chicago, IL*

RÉSUMÉ

Contexte : La dégénérescence maculaire liée à l'âge (DMLA) est la principale cause de cécité dans les sociétés occidentales vieillissantes et entraîne plus de 50 % du total des incapacités visuelles aux États-Unis. Ce rapport décrit l'histoire d'un optométriste de 66 ans qui lutte avec succès contre la DMLA depuis 25 ans.

Rapport de cas : Acuité visuelle et série de photographies de la rétine de 1983 à 2009 à mesure que diverses modifications des habitudes alimentaires et des habitudes de vie non alimentaires ont été mises en œuvre. Après avoir commencé à prendre des suppléments nutritionnels à base de lutéine environ 15 ans après le diagnostic, l'optométriste a vu son acuité visuelle selon l'échelle de Snellen s'améliorer dans son œil droit pour passer de 20/40 à 20/25, combinée à une amélioration subjective de la distorsion, mais elle a éventuellement régressé à 20/70-20/80 accompagnée d'une augmentation de la métamorphopsie. Dans l'œil gauche, l'acuité visuelle de 20/30 au début s'est améliorée à 20/15 et est demeurée stable à 20/20 accompagnée d'une résolution complète de la métamorphopsie et d'une résolution quasi complète du scotome parafovéal. Des photographies du fond de l'œil démontrent une réduction du dénombrement des drusens mous et durs au fil du temps dans chaque rétine et une repigmentation parafovéale possible de zones atrophiques après l'ajout ultérieur de zéaxanthine à plus forte dose.

Conclusions : La DMLA est une maladie qui répond à la nutrition. Le caroténoïde, la lutéine et la zéaxanthine semblent constituer des éléments thérapeutiques particulièrement robustes de formulations de suppléments nutritionnels.

Mots clés : Dégénérescence maculaire liée à l'âge, lutéine, zéaxanthine.

Case Report
An OD's Struggle

ABSTRACT

Background: Age-related macular degeneration (AMD) is the leading cause of blindness in ageing western societies and accounts for greater than 50% of all US visual disability. This report describes the 25-year history of a 66-year-old optometrist who has successfully endured AMD.

Case Report: Visual acuity and serial retinal photographs from 1983 to 2009 as various nutritional modalities and non-dietary lifestyle changes were introduced. After starting lutein-based nutritional supplements beginning at approximately 15 years from diagnosis, the optometrist's Snellen visual acuity improved in his right eye from 20/40 to 20/25 with a subjective improvement in distortion, but eventually regressed to 20/70-20/80 with some increase in metamorphopsia. The left eye, initially 20/30, improved to 20/15 and has remained stable at 20/20 with complete resolution of metamorphopsia and near complete resolution of a parafoveal scotoma. Fundus photographs demonstrate a reduction in soft and hard drusen count over time in each retina and possible parafoveal repigmentation of atrophic areas with later addition of higher dose zeaxanthin.

Conclusions: AMD is a nutrition-responsive disease. The carotenoids, lutein and zeaxanthin appear to be particularly robust therapeutic components of nutritional supplement formulations.

Key words: *age-related macular degeneration, lutein, zeaxanthin*

A then 41-year old Caucasian male optometrist (one of this report's authors, TP) was diagnosed with atrophic AMD in 1983 and initiated a plethora of over-the-counter supplements, including the original pre-lutein Bausch & Lomb Ocuvite and Ocuvite Extra, Alcon ICAPS and ICAPS Plus, vitamin E, rose hip and Centrum. Baseline fundus photos taken in 1983 (*Figure 1a*) and 1988 (*Figure 1b*) demonstrated an increasing number and size of drusen over this five-year period despite this aggressive dietary supplement regimen. During the next 10 years, TP continued to monitor the disease and to take the supplements in an effort to slow disease progression.

In September 1997 at the age of 55, TP reported the development of metamorphopsia OU and a parafoveal scotoma was discovered on automated perimetry OS (not shown). Photos taken in 1998 demonstrated numerous intermediate-sized, and some large, soft, confluent drusen bilaterally (*Figure 1c*). During a consultation with an ophthalmologist in 1998, TP was told he may not be able to practice optometry in one-to-two years based on his fundus findings. The metamorphopsia he reported was accompanied by a reduction in visual acuity that appeared to support the ophthalmologist's contention. Visual acuity decreased from 20/20 each eye to 20/40 OD, 20/30 OS. What makes this case compelling is serial photographic documentation TP collected, meticulously tracking the progression of his atrophic AMD (*Figures 1d – 1g*).

A new plan

Undaunted by his prognosis, TP revised his intervention plan in 1998. After discontinuing all previous supplements, he started a new regimen composed solely of Nutraceutical Sciences Institute (NSI) OcuPower (*Table 1*), currently in its fourth formulation. After only eight weeks of taking NSI OcuPower, TP noticed a subjective visual improvement OS, including decreased metamorphopsia and more vivid colour recognition. Vision in the right eye also improved, with an estimated 30% reduction in metamorphopsia. After nine months of taking the supplement, his visual acuity improved from 20/40 to 20/25 OD and from 20/30 to 20/15 OS. A year later, TP no longer noticed metamorphopsia OU and the scotoma OS had markedly decreased in size. There were also visible salutary changes in his retinal images with respect to number and size of drusen (*Figures 1c – 1f*).

TP stated his night vision was never affected by the atrophic AMD. Neither did he feel that his ability to practice optometry was ever jeopardized. Specifically, he did not need to change the lighting in his examination rooms, nor did he need to modify day-to-day procedures, such as performing direct ophthalmoscopy.

In November 2003, TP added an omega-3 supplement to his NSI OcuPower regimen after reading

about the beneficial effects of essential fatty acids in slowing AMD progression.[7] He also started taking a mitochondrial support supplement, called Phototrop, containing 10 mg coenzymeQ10, 390 mg omega-3 and 100 mg acetyl l-carnitine. Phototrop's combination was shown to improve visual functioning in a clinical research study.[8,9]

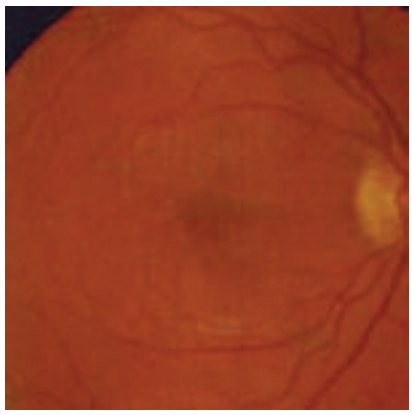
Bolstered by his visual and funduscopic improvements, TP added EyePromise, containing high-dose zeaxanthin, to round out his supplementation regimen in May 2004 after emerging research suggested that this foveal carotenoid may play an important role in central macular health.[4,5,6] Photos taken in August 2005 (*Figure 1g*) and February 2008 (*Figure 1h*) demonstrated a dramatic decrease in drusen OU, possibly attributed to his regimen of NSI OcuPower, EyePromise, Phototrop and omega-3 supplements (*Table 2*). The drusen were smaller and fainter, and an encouraging "re-pigmentation of the atrophic areas" was noted by TP when evaluating his own fundus photos. Unfortunately, visual acuity in his right eye regressed to 20/40. The left eye however, remained stable at 20/15. Strikingly, no metamorphopsia was present.

The latest photos, from February 2009 (*Figure 1g*), 11 years after adding carotenoids, show further significant reduction of pre-existing drusen, with some persistent geographic atrophy now affecting the fovea in the right eye. TP noted increasing metamorphopsia OD, but no metamorphopsia OS,

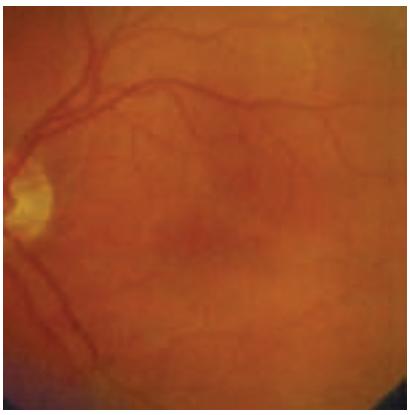
Figure 1 – (a – c)

Baseline bilateral fundus photographs of optometrist, TP, taken in 1983 (1a, age 41) and 1988 (1b, age 46), prior to nutritional supplementation with NSI OcuPower®, Phototrop® and EyePromiseTM. Serial fundus photographs (1c-1g), including before the start of lutein (1c) and zeaxanthin (1e) based nutritional supplementation.

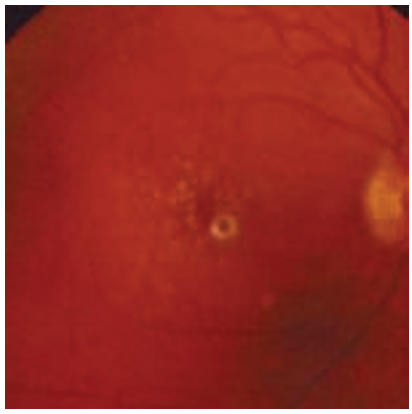
RIGHT EYE

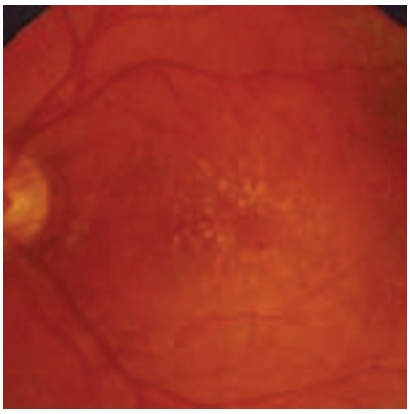


LEFT EYE

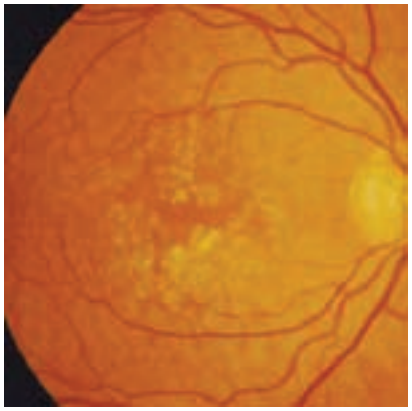


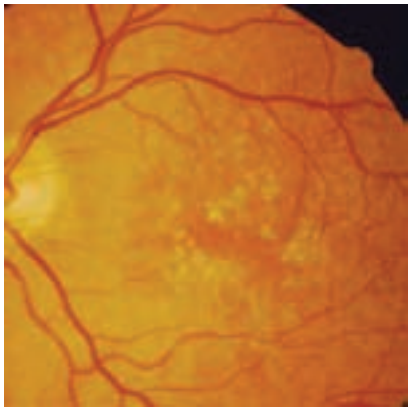
1a : *1983 – First diagnosis*





1b : *1988 – 5 years later*





1c : *1/23/98 -- Carotenoids*

with acuities of 20/70- OD and 20/20 OS. No significant cataract or other media opacity was found at the February 2009 visit.

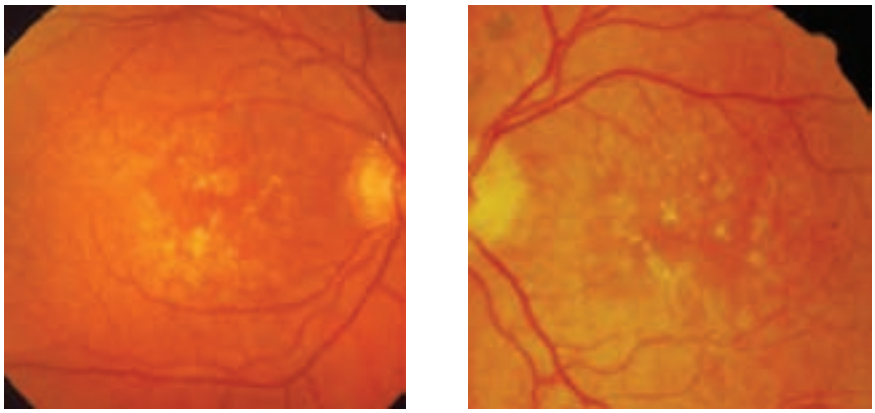
Other dietary & non-dietary lifestyle modifications

TP's nutritional regimen didn't stop with the addition of the supplements noted above. In 1998 he began eating wolfberries (goji berries), another source of zeaxanthin, daily. He also consumed more kale, collard greens, turnip greens, spinach, and mustard greens – all prime sources of lutein to elevate his macular pigment optical density.[10] In December 2003, he added a combination bioflavonoid capsule, containing grape seed, green tea and red wine extract taken twice daily after reading evidence that these components may contribute to lower cholesterol levels and better retinal pigment epithelial (RPE) function, which in turn may slow the progression of AMD.[11] Additionally, TP increased his intake of oily fish, such as salmon and sardines, to raise his omega-3 level. He has avoided overcooked foods, especially overcooked vegetables.[12] He has limited intake of commercial hydrogenated or partially-hydrogenated oils, known to dramatically increase the risk of cardiovascular disease[13] and associated with late AMD.[14]

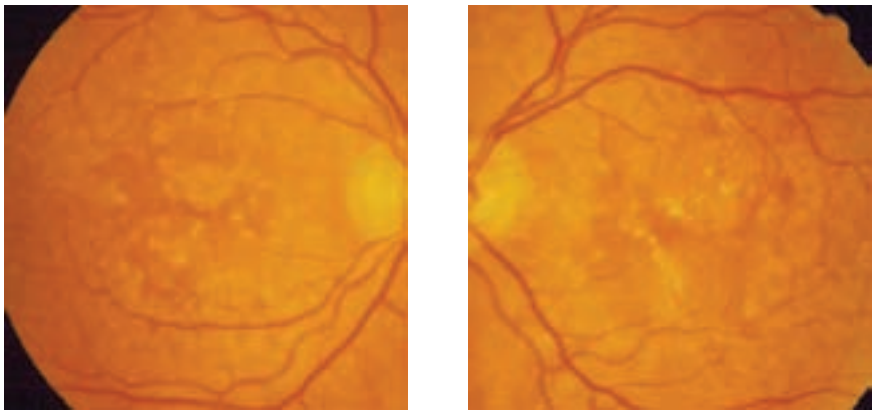
TP is a non-smoker, which is beneficial in light of the Beaver Dam Eye Study in the US, the Blue Mountain Eye Study in Australia, and Rotterdam Study in the Netherlands, which all found a significant association between smoking and AMD.[11] He controls his weight through routine exercise, which is also important because lower body mass index (BMI) and increased physical activity have been shown to decrease the rate of progression to advanced forms of AMD.[15] TP wears ultraviolet/blue-light blocking sunglasses to protect his eyes when outdoors.[16,17]

Figure 1 – (d –e)

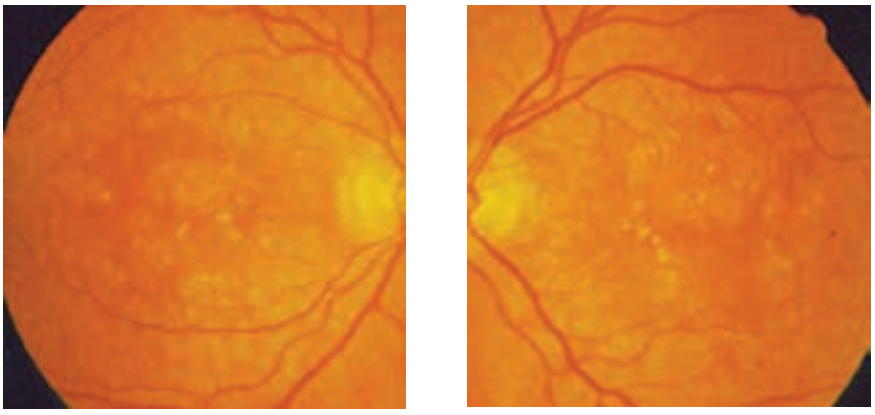
RIGHT EYE LEFT EYE



1d : *1/26/00*



1e : *8/5/2003*



1f : *8/18/05*

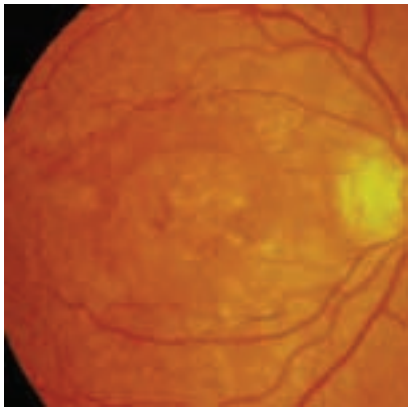
Discussion

We have presented in a sense the un-natural/natural history of AMD in a practicing optometrist over a 25-year period. Serial retinal photos, with introduction of carotenoids in 1998, indicate a progressive decrease in the number and size of drusen and atrophic areas in both of TP's retinas. Despite a recent increase in metamorphopsia and decrease in acuity OD, TP's visual acuity has remained stable OS at 20/20, and his central visual fields remain largely intact. TP only recently retired from his private optometric practice in Norway, Maine, where he performed comprehensive eye care for 44 years until January 2010, when he retired at the age of 67.

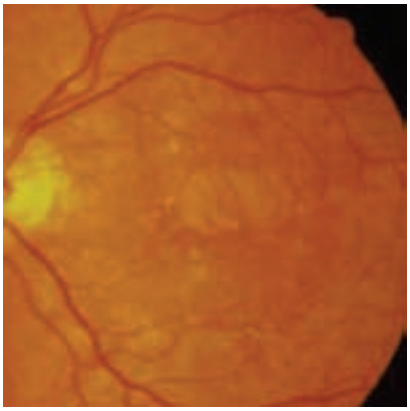
When originally released, NSI OcuPower contained only 1mg of lutein. Lycopene was added in the second formulation. In the third formulation, lutein concentration was increased to 10mg. In the fourth formulation 500mcg of zeaxanthin was introduced. This is the version of NSI OcuPower (*Table 1*) that was evaluated during the LAST study.[2] A newer formulation is now available, now under the name NSI Synergy OcuPower Advanced. Carotenoids appear to be specifically important in this case. Lutein, an oxy-carotenoid, is believed to protect the macula by blocking blue light which helps to improve contrast sensitivity in certain situations[18,19], while reducing glare disability.[20] It is believed to function as an antioxidant, improving photo-stress recovery time and

Figure 1 – (g)

RIGHT EYE



LEFT EYE



1g : *1g 02/06/09 (11 years)*

providing structural integrity to photoreceptors by its conversion to meso-zeaxanthin.[10] Patients with AMD have less macular lutein than those without the disease, as determined through autopsy and in vivo measurements, and macular lutein decreases with aging, smoking and obesity – the three major risk factors for AMD.[11,15] Using heterochromic flicker photometry, the LAST study demonstrated that lutein supplementation increased mean MPOD by 36% in the study group that received 10mg lutein only, and by 43% in the group receiving the multi-nutrient NSI OcuPower supplement. Snellen visual acuity and contrast sensitivity also improved statistically. Additionally, some study participants even experienced a subjective decrease in Amsler grid metamorphopsia and their scotoma(s).[2]

The authors of this paper conclude that future optometry practice should include some rudimentary measurement of glare recovery (in seconds) as well as some measure of low contrast vision assessment, i.e. 10% low contrast screening evaluation to assess photoreceptor/RPE health. In this case, such data would have provided a metric for following subjective reports and more precisely defined the results of multiple therapeutic interventions. Notably TP had AMD at the early age of 41. Glare recovery and contrast sensitivity assessment would be particularly useful for all patients older than for example, 50 years of age. Unfortunately in this case, only traditional Snellen visual acuity (circa 1862) and Amsler grid (1895) are available. Nonetheless, although we cannot prove causality with a single case report, the retinal photographs presented within this report appear to demonstrate a dynamic disease process amenable to nutritional intervention.

Table 1 – *Components of lutein-based multivitamin, multi-mineral formulation in NSI OcuPower®, containing FloraGlo ® lutein. The formulation is taken at the indicated dose of three times per day. The formulation has changed since the LAST study and the name is now NSI Synergy Ocupower Advance® (www.Vitacost.com).*

Nutraceutical Sciences Institute (NSI) OcuPower	
Supplement facts: Serving size - 6 capsules (taken TID)	
Component	Full daily dose
Pro-vitamin A (as natural carotenoids: beta carotene, alpha carotene, lutein, zeaxanthin, cryptoxanthin) (Betatene)	4,900 IU
Vitamin A (as palmitate)	100 IU
Vitamin C (as calcium ascorbate) (Ester-C MV)	250 mg
Vitamin D3 (as cholecalciferol)	700 mg
Mixed vitamin E (as d-alpha tocopherol succinate and mixed tocopherols)	210 IU
Vitamin B1 (thiamine HCl)	20 mg
Vitamin B2 (riboflavin)	10 mg
Vitamin B3 (niacinamide)	20 mg
Vitamin B6 (pyridoxine HCl)	20 mg
Folic acid (as folacin)	1 mg (1,000 mcg)
Vitamin B12 (methylcobalamin)	500 mcg
Biotin	500 mcg
Vitamin B5 (pantothenic acid)	20mg
Calcium (ascorbate, Ester-C MV)	25 mg
Magnesium (oxide)	100 mg
Zinc (as L-methionine) (L-OptiZinc)	25 mg
Selenium (selenomethionine)	200 mcg
Manganese (as amino acid chelate)	2 mg
Copper (as amino acid chelate)	1 mg
Chromium (chromium polynicotinate) (ChromeMate)	400 mcg
Molybdenum (as amino acid chelate)	150 mcg
Bilberry extract (standardized to 25% anthocyanosides) (fruit)	40 mg
Lycopene (from 120 mg standardized 5% Lyc-O-Mato lycopene extract) (fruit)	6 mg
Lutein (from 200 mg standardized 5% FloraGLO Lutein extract) (marigold flower)	10 mg
Zeaxanthin (from 200 mg standardized .22% FloraGLO Lutein extract) (marigold flower)	500 mcg
Alpha lipoic acid	150 mg
Bioflavonoid (as quercetin)	100 mg
Bioflavonoid (as rutin)	10 mg
Bioflavonoid (citrus biocomplex standardized to 50%)	10 mg
Black pepper (Peper nigrum) (fruit extract) (BioPerine)	5 mg
Ginko biloba (ginkgoaceae) (leaves) (standardized 24% ginko flavon glycosides, 6% terpene lactones)	120 mg
L-Taurine	100 mg

Other ingredients: Kosher gelatin (capsule), cellulose, silica magnesium stearate

Acknowledgements

We are indebted to Tere Porter, OD, for carefully documenting his affliction. Special thanks to Vitacost.com (Boyton Beach, FL), Kemin Health, Inc. FloraGlo ® lutein (Des Moines, IA) and ZeaVision ® (St Louis, MO) for their expertise in supplying Dr. Porter with information and encouragement. The authors also acknowledge the Captain James A Lovell FHCC / Department of Veterans Affairs Medical Center, North Chicago, IL, Naval Health Clinic Great Lakes, Great Lakes, IL, Department of Family & Preventive Medicine at Rosalind Franklin University of Medicine & Science, North Chicago, IL.

References

1. Age-Related Eye Disease Study Research Group. A randomized, placebo-controlled, clinical trial of high-dose supplementation with vitamins C and E and beta carotene for age-related cataract and vision loss: AREDS report no. 9. Arch Ophthalmol 2001; 119(10):1439-52.
2. Richer S, Stiles W, Statkute L, et al. Double-masked, placebo-controlled, randomized trial of lutein and antioxidant supplementation in the intervention of atrophic age-related macular degeneration: the Veterans LAST study [Lutein Antioxidant Supplementation Trial]. Optometry 2004 April; 75(4):216-30.
3. Parisi V, Tedeschi M, Gallinaro G, et al.; CARMIS Study Group. Carotenoids and antioxidants in age-related maculopathy italian study: multifocal electroretinogram modifications after 1 year. Ophthalmology. 2008;115(2):324-333.e2.
4. Trieschmann M, Beatty S, Nolan JM, Hense HW, et al. Changes in macular pigment optical density and serum concentrations of its constituent carotenoids following supplemental lutein and zeaxanthin: the LUNA study. Exp Eye Res. 2007;84(4):718-28.
5. Schalch W, Cohn W, Barker FM, et al. Xanthophyll accumulation in the human retina during supplementation with lutein or zeaxanthin - the LUXEA (LUtein Xanthophyll Eye Accumulation) study.Arch Biochem Biophys. 2007 15;458(2):128-35.

Table 2 – *Visual and ophthalmic timeline for TP.*

DATE (d/m/y)	EVENT	FUNDUS	VISUAL ACUITY	META-MORPHOPSIA
1983	TP diagnosed with atrophic AMD; fundus photo taken	Scattered mild drusen OU	20/20	None
1983-1987	TP taking Ocuvite, Ocuvite Extra, ICAPS, ICAPS Plus, vitamin E, rose hip and Centrum	NC	NC	NC
1988	Fundus photo taken	Increasing drusen OU	NC	NC
9/1997	TP performs HVF and finds small parafoveal scotoma OS	NC	NC	OD, OS
1/23/1998	Baseline fundus photos OU	Large drusen and pigment changes OU	NC	NC
2/1998	TP discusses fundus photos with ophthalmologist, begins taking OcuPower and d/c's all other supplements.	NC	20/40 OD, 20/30 OS	NC
1/26/2000	2-year fundus photo OU	Decreasing size and number of drusen OU	20/20 OD, 20/15 OS	None
8/3/2000	2.5-year fundus photo	NC	NC	NC
8/5/2003	5.5-year fundus photo	NC	NC	NC
11/2003	TP begins taking Phototrop and Omega-3 supplement.	NC	NC	NC
12/2003	TP begins taking bioflavinoid capsule.	NC	NC	NC
5/2004	TP begins taking EyePromise.	NC	NC	NC
8/18/2005	7.5-year fundus photo	Decrease in drusen OU	20/40 OD, 20/15 OS	NC
2/06/2009	11-year fundus photo	Fewer drusen, more depigment-ation OU	20/70-20/80 OD, 20/20 OS	Increasing meta-morphopsia OD

Legend: NC – no change, d/c - discontinue

6. Richer SP, Stiles WR, Levin MR, et al. The Zeaxanthin and Visual Function Study in Atrophic Age Related Macular Degeneration (ZVF-FDA IND #78,973) – MP and Foveal Shape Discrimination Data. Invest Ophthalmol Vis Sci. 2010: ARVO E-Abstract 510.
7. SanGiovanni JP, Chew EY, Clemons TE, et al. The relationship of dietary lipid intake and age-related macular degeneration in a case-control study: AREDS Report No. 20. Arch Ophthalmol 2007;125(5):671-9
8. Feher J, Papale A, Mannino G, et al. Mitotropic Compounds for the treatment of age-related macular degeneration. Ophthalmologica. 2003;217:351-357.
9. Feher J, Kovacs B, Kovacs I, et al. Improvement of visual functions, and fundus alterations in early age-related macular degeneration treated with a combination of acetyl-L-carnitine, n-3 fatty acids, and coenzyme Q10. Ophthalmologica 2005;219:154–166.
10. Bernstein PS, Delori FC, Richer S, et al. The value of measurement of macular carotenoid pigment optical densities and distributions in age-related macular degeneration and other retinal disorders. Vision Res. 2010;50(7):716-28.
11. Tomany SC, Wang JJ, Van Leeuwen R. et al. Risk factors for incident age-related macular degeneration: pooled findings from 3 continents. Ophthalmology. 2004;111(7):1280-7.
12. Maiani G, Periago Castón MJ, Catasta G, et al. Carotenoids: Actual knowledge on food sources, intakes, stability and bioavailability and their protective role in humans. Mol Nutr Food Res. 2009;53(S2):S194-S218.
13. Teegala S, Willett W, Mozaffarian D. Consumption and health effects of trans fatty acids: A review. J AOAC Int. 2009;92(5), 1250-1257.
14. Chong EW, Robman LD, Simpson JA, et al. Fat consumption and its association with age-related macular degeneration. Arch Ophthalmol. 2009;127(5):674-680.
15. Seddon JM, Cote J, Davis N, et al. Progression of age-related macular degeneration: association with body mass index, waist circumference, and waist-hip ratio. Arch Ophthalmol. 2003; 121(6):785-92.
16. Kernt M, Neubauer AS, Liegl R, et al. Cytoprotective effects of a blue light-filtering intraocular lens on human retinal pigment epithelium by reducing phototoxic effects on vascular endothelial growth factor-alpha, Bax, and Bcl-2 expression. Cataract Refract Surg. 2009;35(2):354-62.
17. Mukai K, Matsushima H, Sawano M, et al. Photoprotective effect of yellow-tinted intraocular lenses. Jpn J Ophthalmol. 2009;53(1):47-51.
18. Wolffsohn JS, Cochrane AL, Khoo H, et al. Contrast is enhanced by yellow lenses because of selective reduction of short-wavelength light. Optom Vis Sci. 2000;77(2):73–81.
19. de Fez MD, Luque MJ, Viqueira V. Enhancement of contrast sensitivity and losses of chromatic discrimination with tinted lenses. Optom Vis Sci. 2002;79(9):590-7.
20. Stringham JM, Hammond BR. Macular pigment and visual performance under glare conditions. Optom Vis Sci.2008;85(2):82-8.

NEW

FINALLY!

47% of vision corrected patients have astigmatism[1], yet most do not wear contact lenses[2].

Finally a daily disposable lens that makes more patients with astigmatism happy.

- BLINK STABILIZED™ Design— for clear and stable vision[3]
- 60 SECOND FIT— helps reduce patient chair time[3]
- LACREON® Technology— for exceptional all-day comfort[3]
- WIDEST PARAMETER RANGE*— to fit nearly all patients[3]

1-DAY ACUVUE® MOIST® BRAND CONTACT LENSES FOR ASTIGMATISM

INNOVATION FOR HEALTHY VISION™

MOST TRUSTED CANADIAN BRAND[4]

*Compared to other daily disposable toric lenses.

References: 1. Young Y, Phil M, Sulley A, et al. Prevalence of astigmatism in relation to soft contact lens fitting. *Eye Contact Lens.* 2011;37:20-25. **2.** Johnson & Johnson Vision Care, Canadian Incidence 2011. **3.** Data on file. Johnson & Johnson Vision Care, Inc., 2007-2011. **4.** ACUVUE® is the most trusted brand of contact lenses by Canadian Optometrists, Opticians and Ophthalmologists. Data on file. Johnson & Johnson Inc. 2011.

ACUVUE® Brand Contact Lenses are indicated for vision correction. As with any contact lens, eye problems, including corneal ulcers, can develop. Some wearers may experience mild irritation, itching or discomfort. Lenses should not be prescribed if patients have any eye infection, or experience eye discomfort, excessive tearing, vision changes, redness or other eye problems. Consult the package insert for complete information. Complete information is also available from Johnson & Johnson Vision Care, Division of Johnson & Johnson Inc., by calling 1-800-267-5098 or by visiting www.jnjvisioncare.ca.

ACUVUE®, 1-DAY ACUVUE® MOIST®, BLINK STABILIZED™, LACREON® and INNOVATION FOR HEALTHY VISION™ are trademarks of Johnson & Johnson Inc.

© Johnson & Johnson Inc. 2012. March 2012

Now, bio-inspiration is...

...advancing lens care, too.

WHAT IS BIO-INSPIRATION?

Bio-inspiration is a discipline that studies and learns from nature's best ideas to generate breakthrough products and technologies. It's how the butterfly's wing led to more energy-efficient LED displays.

Bausch + Lomb eye health scientists looked for inspiration by studying how the eye works and developed a new contact lens disinfectant...

Introducing Biotrue™ multi-purpose solution.

Inspired by the biology of your eyes.

Biotrue goes beyond excellent disinfection by bringing together three bio-inspired innovations:

- pH balanced to match tears
- contains a lubricant, to help keep lenses moist and comfortable throughout the day
- keeps certain beneficial tear proteins active

Biotrue helps make contact lens wear easier on your patients' eyes[1].

For more information, visit **www.bausch.ca**

BAUSCH + LOMB

1. Based on a patient use study.

®/™ are trademarks of Bausch & Lomb Incorporated or its affiliates. All other brand/product names are trademarks of their respective owners. © Bausch & Lomb Incorporated. HL XXXX TP7551