

## Age-related macular degeneration: armed against ARMD

### Background and epidemiology:

Age-related macular degeneration (ARMD) is a leading cause of legal blindness (best vision below 20/200) among older people in North America. A degenerative disorder of the retinal pigment epithelium and neurosensory retina, ARMD is characterized by slow, insidious central vision loss. It is strongly associated with aging, with an estimated prevalence of less than 1% among white Americans in their sixth decade of life and more than 15% in the ninth decade of life.<sup>1</sup> Additional risk factors include female sex, white race, cigarette smoking, low dietary intake of carotenoids, increased exposure to sunlight and comorbid cardiovascular disease.<sup>1,2</sup> The pathophysiologic features and development of ARMD are poorly understood. Evidence from familial aggregation, twin and case-control studies suggests that familial or genetic factors may play a role, but of the 6 or more genes studied, no single gene appears to cause even a fraction of the cases of ARMD.<sup>2</sup>

Early-stage ARMD is characterized clinically by the presence of drusen (accumulations of amorphous, acellular debris) within the basement membrane

of retinal pigment epithelium. Drusen are seen ophthalmoscopically as yellow spots within the macula (Fig. 1), the portion of the central retina with the greatest concentration of photoreceptors. Whereas small drusen (< 63 µm) are commonly present in the macula as a consequence of aging, numerous large drusen are associated with ARMD.<sup>2</sup> There are 2 types of ARMD. "Dry" ARMD accounts for about 85% of cases and is characterized by areas of retinal pigment epithelial loss and a slow course of visual loss; "wet" ARMD affects about 15% of cases and involves choroidal neovascularization (CNV) and potentially precipitous loss of central vision (Fig. 1).

**Clinical management:** Ophthalmoscopy is used to diagnose the condition. CNV can be identified by the presence of fluorescein dye within the neovascular tissue using intravenous fluorescein angiography.

Most treatment modalities focus on slowing the progression of CNV by provoking subretinal vascular endothelial damage and occlusion. In some cases laser photocoagulation of subretinal blood vessels can reduce the ultimate extent of visual loss by con-

fining the area of the lesion; however, the overlying neurosensory retina is also damaged, which results in some degree of immediate decline in visual acuity. Photodynamic therapy aims to occlude CNV vessels while avoiding the concomitant damage to the neurosensory retina by intravenous administration of a photosensitive drug that is activated locally upon exposure to a nonthermal light at a wavelength specific to the drug.<sup>2</sup> Upon activation the drug forms singlet oxygen and free radicals that damage vascular endothelial cells and provoke occlusion. Studies are underway that look at the effectiveness of external beam radiotherapy, vitreoretinal microsurgery and medical therapy that targets vascular endothelial growth factors.<sup>2</sup>

**Prevention:** The most important treatable risk factor for ARMD is smoking, which leads to a 3-fold increased risk of the disease.<sup>3</sup> A recent randomized placebo-controlled trial of the effect of high-dose vitamins C and E, betacarotene and zinc supplementation on ARMD progression and visual acuity demonstrated no benefit among people with mild disease (i.e., visual acuity at least 20/32 and any of mul-

### Resource for patients

Patients interested in learning more about macular degeneration and other eye disorders can visit the public information service of the Canadian Ophthalmological Society ([www.eyesite.ca/english/public-information/eye-conditions/index.htm](http://www.eyesite.ca/english/public-information/eye-conditions/index.htm)).

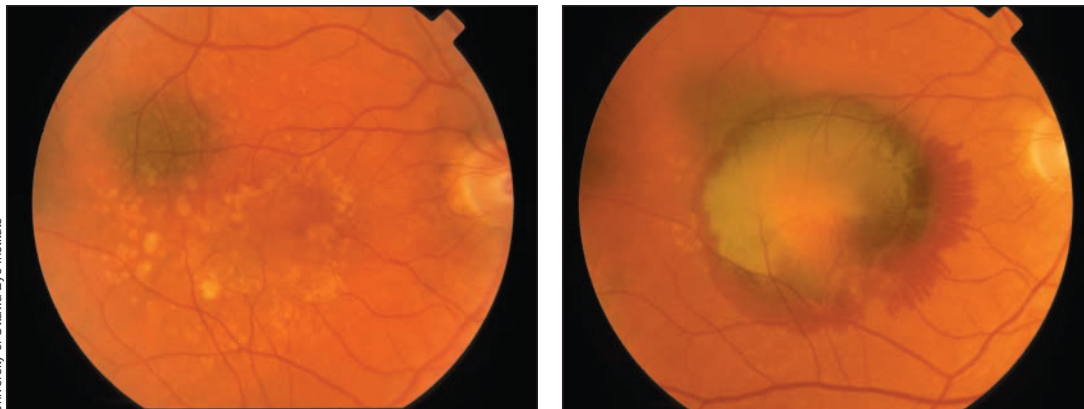


Fig. 1: Left: Retina of patient with "dry" age-related macular degeneration, showing drusen (yellow spots) in the macula. Right: Retina of same patient months later, showing progression to "wet" degeneration, with fresh blood under the macula and greatly reduced central vision. These images emphasize the importance of taking every possible step to avoid progression from dry to wet macular degeneration.

multiple small drusen, single or nonextensive intermediate drusen, or pigment abnormalities) but a significant risk reduction (odds ratio 0.72, 99% confidence interval 0.52–0.98) among people with more advanced ARMD.<sup>4</sup> The results suggest an absolute risk reduction of 6% (29%–23%; number needed to treat, 17) in the proportion of people with more advanced disease progressing to at least a 15-letter decrease in visual acuity score over 5 years with daily zinc and antioxidant supplementation compared with placebo. Given that an estimated 8 million people at least 55 years old in the United States have more advanced ARMD, the public health impact of treating this population with supplements to

avoid visual deterioration is potentially great.<sup>5</sup> In light of the recent studies showing an unexpected increased risk of lung cancer among smokers taking beta-carotene, physicians and patients should be reminded of the potential risks of taking vitamins.<sup>6</sup>

People with loss of central vision benefit from early visual rehabilitation with aids such as magnifiers and improved illumination. Adults aged 45 and older should undergo a comprehensive eye examination that includes central acuity testing and dilated eye examination every 2–4 years to facilitate early detection of ARMD.

Erica Weir  
CMAJ

## References

1. Congdon N, Friedman D, Lietman T. Important causes of visual impairment in the world today. *JAMA* 2003; 290:2057-60.
2. Gottlieb J. Age-related macular degeneration. *JAMA* 2002;288:2233-6.
3. Seddon JM, Willett WC, Speizer RD, Hankinson SE. A prospective study of cigarette smoking and risk of age-related macular degeneration in women. *JAMA* 1996;276:1141-6.
4. Age-Related Eye Disease Study Research Group. A randomized, placebo-controlled clinical trial of high-dose supplementation with vitamins C and E, beta carotene and zinc for age-related macular degeneration and vision loss [AREDS report no 8]. *Arch Ophthalmol* 2001;119:1417-36.
5. Age-Related Eye Disease Study Research Group. Potential public health impact of age-related eye disease study results [AREDS report no 11]. *Arch Ophthalmol* 2003;121:1621-4.
6. Woollerton E. Too much of a good thing? Toxic effects of vitamin and mineral supplements. *CMAJ* 2003; 169(1):47-8.

## BOOKS RECEIVED

Bandman B. **The moral development of health care professionals.** Westport (CT): Praeger; 2003. 208 pp. US\$69.95 ISBN 0-86569-259-9

Caughey AB, del Castillo C, Palmer N, Spizer K, Tuttle DN. **Pathophysiology: renal, hematology, and oncology.** Blueprints Notes and Cases series. Malden (MA): Blackwell; 2004. 192 pp. US\$26.95 ISBN 1-4051-0352-3

Cheng A, Williams BA, Sivarajan VB, editors. **The HSC handbook of pediatrics, 10th ed.** Toronto: Elsevier Canada; 2003. 1080 pp. \$75.95 ISBN 0-920513-69-7

Doran CM. **Prescribing mental health medication: the practitioner's guide.** New York and London: Routledge; 2003. 442 pp. US\$39.95 ISBN 0-415-28222-5

Isba R. **Rapid infectious diseases and tropical medicine.** Malden (MA): Blackwell; 2004. 184 pp. US\$29.95 ISBN 1-4051-1325-1

Johnson BA, Ruiz P, Galanter M. **Handbook of clinical alcoholism treatment.** Baltimore: Lippincott Williams & Wilkins; 2003. 287 pp. US\$39.95 ISBN 0-7817-4158-0

Leung G, Tran S, Tan T, Caughey A. **Pathophysiology: cardiovascular, endocrine, and reproduction.** Blueprints Notes and Cases series. Malden (MA): Blackwell; 2004. 187 pp. US\$26.95 ISBN 1-4051-0350-7

Marinella M. **Pocket guide of 50 unusual symptoms.** Malden (MA): Blackwell; 2002. 122 pp. US\$19.95 ISBN 1-4051-0431-7

McCrae M. **The National Health Service in Scotland: origin and ideals, 1900–1950.** East Linton (UK): Tuckwell; 2003. 288 pp. £25.00 ISBN 1-86232-216-3

McGrath PJ, Finley GA. **Pediatric pain: biological and social context.** Seattle (WA): IASP Press; 2003. 225 pp. US\$76.00 ISBN 0-931092-49-3

Neugroschl J, Hoblyn J, del Castillo C, Caughey AB. **Behavioral Science and Epidemiology.** Blueprints Notes and Cases series. Malden (MA): Blackwell; 2004. 201 pp. US\$26.95 ISBN 1-4051-0355-8

Nolin PC, Kenny C. **Cannabis: report of the Senate Special Committee on Illegal Drugs,**

**abridged version.** Toronto: University of Toronto Press; 2003. 229 pp. \$50.00 ISBN 0-8020-8946-1

Saibil F. **Crohn's disease and ulcerative colitis.** Toronto: Key Porter; 2003. 224 pp. \$19.95 ISBN 1-55263-543-0

Sam AH. **Differential diagnosis: A–Z of symptoms, signs and laboratory test results in medicine.** Rapid series. Malden (MA): Blackwell; 2003. 112 pp. US\$29.95 ISBN 1-4051-1097-X

Shah CP. **Public health and preventive medicine in Canada, 5th ed.** Toronto: Elsevier Canada; 2003. 595 pp. \$54.95 ISBN 0-9205-1393-X.

Spittell J. **Peripheral vascular disease for cardiologists: a clinical approach.** Elmsford (NY): Blackwell/Futura; 2004. 144 pp. US\$54.95 ISBN 1-4051-0366-3

Sullivan T, Evans W, Angus H, Hudson A, editors. **Strengthening the quality of cancer services in Ontario.** Ottawa: CHA Press; 2003. 274 pp. \$49.95 ISBN 1-896151-09-4