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Hilary A. Beaver *Editors*

Geriatric Ophthalmology

A Competency-based Approach

Foreword by David Solomon, MD



Springer

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Editors

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Dr. Andrew Lee would like to dedicate this book to his parents, Alberto C. Lee, M.D. and Rosalind L. Go Lee, M.D who taught him that wisdom comes with age and that it is not the years in your life that count but the life in your years.

Foreword

Trends in the make-up of the population, however major, tend to be ignored at first. However, eventually, such trends are recognized and accorded the importance they deserve. So is it with the exploding size of the over-65 cohort of the American population, a trend whose handwriting has been on the wall since the early 1970s. Now, finally, it is perfectly obvious to health care planners that the next frontier for all disciplines of medicine except pediatrics and obstetrics is to improve the availability, efficiency, and quality of health care for older Americans and older people in most other countries as well.

Many studies of the current quality of health care provided to older people have produced convincing evidence that quality is far below what it should be and that older patients are particularly vulnerable to adverse health consequences that stem from poor quality of care. Thus, it is clearly time for action and the first step is enhanced educational materials.

This book, *Geriatric Ophthalmology: A Competency-Based Approach*, is appropriately action-oriented, aimed accurately at the target of improved ophthalmologic care of elderly patients. Its authors are two of a rising generation of leaders, committed to intensify the focus of their specialty on the unique aspects of prevention, diagnosis, treatment, and follow-up that are essential for optimal care of eye conditions in elderly patients. Having seized the initiative on geriatric ophthalmology at least a decade ago, they are ideally suited to present a volume that will have an important impact on the present and future revolution in eye care for older patients.

Geriatricians like myself have been proud to collaborate with Andrew Lee and Hilary A. Beaver and others in exploring and disseminating knowledge about the geriatric syndromes and age-associated disorders that color the management of ophthalmologic conditions (and conditions of every other organ system). We also have focused together on the major eye diseases that predominate in the older population—age-associated macular degeneration, diabetic retinopathy, glaucoma, and cataract. That today's ophthalmologists must become effective geriatric ophthalmologists becomes obvious when we just list those four high-incidence conditions.

It is an odd feature of American medicine that pediatric ophthalmology and urology, cardiology, etc. have been identified as subspecialties for decades,

while geriatric subspecialties are just now coming to the forefront, even though the number of ophthalmologic patients is markedly greater in the geriatric cohort. Whether a subspecialty of geriatric ophthalmology emerges is almost irrelevant, however, because the main aim of the geriatrics-ophthalmology collaboration is to disseminate knowledge to the comprehensive ophthalmologist. The goal is to help all ophthalmologists to improve the quality of care they provide to the millions of patients suffering from age-associated eye conditions. This is the clear thrust of the current book, and the geriatricians in whose behalf I write unequivocally endorse the idea and the competency-based format characteristic of this volume.

Los Angeles, CA

David H. Solomon MD

Preface

By the time this book comes to print, the demographic shift toward an older-aged America will already be in full swing. The concept of this book was born from three paradigm shifts for the future of eye care in geriatric patients. The first shift is that eye care providers need to move away from the traditional “disease-diagnose-treat” model of ophthalmic care to a more holistic model that emphasizes and promotes “disease prevention, contextual diagnosis, functional assessment, treatment and rehabilitation.” The second shift is the understanding that geriatric patients are more than just “older adults.” A similar shift already has occurred in the evaluation and treatment of pediatric patients who are of course not just “little adults.” There are specific differences in the anatomy, physiology, pathophysiology, pharmacology, clinical presentations, and responses to disease and treatments in older patients. Finally, the third shift is moving from a “medical knowledge” based model of ophthalmic care to a competency-based model. In fact, this textbook could be subtitled, “What every eye doctor needs to know about geriatrics” in order to capture the essence of these three paradigm shifts in geriatric ophthalmology.

We have chosen a case-driven format that highlights “competency based” concepts rather than the traditional medical knowledge-based paradigm. We have attempted to align our teaching exercises with the emerging consensus for more comprehensive understanding and proficiency by eye doctors in general competencies as outlined by the Accreditation Council for Graduate Medical Education (ACGME) and other organizations. The six general ACGME competencies are (1) patient care, (2) medical knowledge, (3) interpersonal skills and communication, (4) professionalism, (5) practice-based learning and improvement, and (6) systems-based practice. Each chapter has an illustrative case that exemplifies the points of care encompassed by the competencies. We hope to provide practical and everyday advice that will increase geriatric expertise among ophthalmic providers.

For the purposes of this text, we will rely upon the ACGME definitions of the six competencies (Table 1). The reader might wish to have this glossary handy in the beginning as the definitions for these competencies are not always intuitive or self-explanatory.

Table 1 ACGME Competencies (from <http://www.acgme.org/outcome/comp/compFull.asp>)

1. *Patient Care*: Residents must be able to provide patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health.
 2. *Medical Knowledge*: Residents must demonstrate knowledge of established and evolving biomedical, clinical, epidemiological and social-behavioral sciences, as well as the application of this knowledge to patient care.
 3. *Practice-Based Learning and Improvement*: Residents must demonstrate the ability to investigate and evaluate their care of patients, to appraise and assimilate scientific evidence, and to continuously improve patient care based on constant self-evaluation and life-long learning. Residents are expected to develop skills and habits to be able to meet the following goals:
 - Identify strengths, deficiencies, and limits in one's knowledge and expertise;
 - Set learning and improvement goals;
 - Identify and perform appropriate learning activities;
 - Systematically analyze practice using quality improvement methods, and implement changes with the goal of practice improvement;
 - Incorporate formative evaluation feedback into daily practice;
 - Locate, appraise, and assimilate evidence from scientific studies related to their patients' health problems;
 - Use information technology to optimize learning; and,
 - Participate in the education of patients, families, students, residents, and other health professionals.
 4. *Interpersonal and Communication Skills*: Residents must demonstrate interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and health professionals. Residents are expected to:
 - Communicate effectively with patients, families, and the public, as appropriate, across a broad range of socioeconomic and cultural backgrounds;
 - Communicate effectively with physicians, other health professionals, and health-related agencies;
 - Work effectively as a member or leader of a health care team or other professional group;
 - Act in a consultative role to other physicians and health professionals; and,
 - Maintain comprehensive, timely, and legible medical records, if applicable.
 5. *Professionalism*: Residents must demonstrate a commitment to carrying out professional responsibilities and an adherence to ethical principles. Residents are expected to demonstrate:
 - Compassion, integrity, and respect for others;
 - Responsiveness to patient needs that supersedes self-interest;
 - Respect for patient privacy and autonomy;
 - Accountability to patients, society, and the profession; and,
 - Sensitivity and responsiveness to a diverse patient population, including but not limited to diversity in gender, age, culture, race, religion, disabilities, and sexual orientation.
 6. *Systems-Based Practice*: Residents must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care. Residents are expected to:
 - Work effectively in various health care delivery settings and systems relevant to their clinical specialty;
 - Coordinate patient care within the health care system relevant to their clinical specialty;
 - Incorporate considerations of cost awareness and risk-benefit analysis in patient and/or population-based care as appropriate;
 - Advocate for quality patient care and optimal patient-care systems;
 - Work in interprofessional teams to enhance patient safety and improve patient care quality; and
 - Participate in identifying system errors and implementing potential systems solutions.
-

This book is aimed at residents and fellows as well as clinicians including optometrists and ophthalmologists in practice and is designed to be a practical and clinically based tool for the evaluation and care of geriatric patients in the ambulatory eye setting.

We do not intend for this book to be all-inclusive and we encourage the reader to invest the time to investigate other areas of geriatric care that might be of applicable to eye care providers. We hope that this little book encourages you to think about geriatric patients with the competencies in mind and with the unique issues of our elderly population. Our goal is not to make eye doctors into geriatricians but simply to increase awareness and expertise by eye doctors in geriatric topics. After all we all will (hopefully) end up joining this demographic someday.

Contents

Scope of the Problem and Demographic Shift in Population: Visual Disease Incidence and Prevalence in the Elderly Population	1
Gwen Sterns	
Refractive Error in the Geriatric Population	7
Hilary A. Beaver	
Cataracts and Cataract Surgery	15
Hilary A. Beaver	
Glaucoma in the Elderly	27
Hilary A. Beaver	
Diabetic Retinopathy and Its Management	37
Neil M. Bressler	
Age-Related Macular Degeneration and Its Management	49
Neil M. Bressler	
Low Vision: When Vision Fails	59
Gwen K. Sterns	
Visual Loss and Depression	65
Andrew G. Lee	
Visual Loss and Dementia	71
Andrew G. Lee	
Visual Loss and Hearing Loss	77
Andrew G. Lee	
Visual Loss and Falls	83
Andrew G. Lee and David Steven Friedman	

Elder Abuse	89
Hilary A. Beaver	
Functional Impairment and Visual Loss	99
Gwen K. Sterns	
The Research Agenda-Setting Project (RASP)	105
David Steven Friedman and Andrew G. Lee	
Screening for Comorbidities	109
Sushma Yalamanchili	
Refer Comorbidities	115
Sushma Yalamanchili	
Index	121

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Scope of the Problem and Demographic Shift in Population: Visual Disease Incidence and Prevalence in the Elderly Population

Gwen Sterns

Medical Knowledge

The increasing number of elderly persons in the United States presents a rising challenge to our medical system and especially to our ophthalmologists. We see this due to the aging of the post-World War II baby boomers and the increasing life expectancies (a high of 76.9 years in 2000). According to a 2006 Census Bureau Report, the US population aged 65 and over is expected to double in size within the next 25 years. They also report that by 2030, almost 20% of Americans, some 72 million people, will be 65 years or older. The age group 85 and older is projected to double from 4.7 million in 2003 to 9.6 million in 2030 and by 2050 it is expected to increase to 20.9 million.¹ This is the fastest growing segment of the US population.

The dramatic demographic shift in the United States toward an older population has impacted the specialty of ophthalmology disproportionately as many common eye disorders occur with increasing frequency and severity with older age.

Ophthalmology is one specialty that will be significantly affected by this demographic shift. As our population ages, we are seeing an increase in age-related eye diseases (AREDS) such as age-related macular degeneration (AMD), cataract, diabetic retinopathy, and primary open-angle glaucoma² and increased visual impairment and blindness. Early recognition and treatment can help prevent vision loss in many of these patients and thus help to prevent and reduce disability from vision loss.

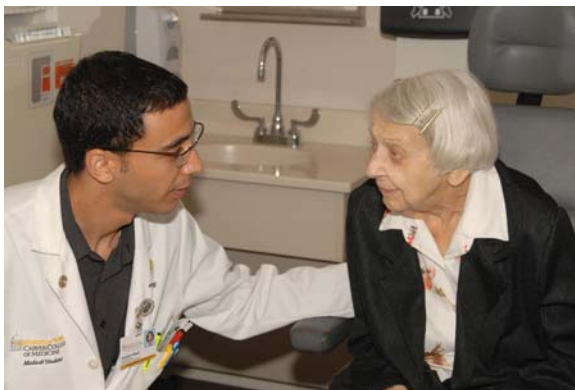
Case Vignette

A 70-year-old African-American man with a history of diabetes mellitus and chronic open-angle glaucoma can no longer safely drive his car. His night vision has deteriorated over the past few months and he damaged his car backing into

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As the elderly population ages, the number of extreme elderly, or those over the age of 85, will continue to advance. Source: Reprinted with permission from the Department of Ophthalmology, The University of Iowa Carver College of Medicine



his garage and hitting the garage door. He is unable to read the road signs and is complaining about the small print in the newspaper. He was last seen by an ophthalmologist 2 years earlier missing several follow-up appointments. He did not feel that the drops he was taking improved his vision, so he stopped his medication. His eye glasses do not seem to work anymore. He finally agreed to see his wife's ophthalmologist. He was told he had advanced optic nerve head cupping and loss of visual field from his untreated glaucoma. He was also found to have cataracts as well as background diabetic retinopathy. His visual loss could have been preventable had he continued his eye care and followed recommended treatment guidelines.

Practice-Based Learning and Improvement

In the elderly population in the United States, the leading causes of age-related vision loss are macular degeneration, glaucoma, diabetes mellitus, and cataract. In the Caucasian population, macular degeneration is the leading cause of blindness whereas glaucoma is the leading cause of blindness in the African-American population. Cataract is the leading cause of low vision in the elderly population. In patients with diabetes and over 40 years of age, 8.3% have vision-threatening diabetic retinopathy.³ To avoid this expected increase in visual impairment and blindness in our elderly population, prevention strategies for those at risk should be implemented. These include regular eye examinations for those with a family history of open-angle glaucoma or those with diabetes. Blood pressure control and glycemic control and smoking cessation can lead to a reduction in vision loss.⁴ This gentleman was at a high risk for loss of vision and his primary care provider with his ophthalmologist have detected disease earlier routine ocular examinations. It is the responsibility of the care provider to educate the patient on all the risks of his disease as well as the responsibility of the patient to schedule appropriate examinations. In a

high-risk population, the caregiver should make an additional effort to schedule examinations and set up a reminder call system for those noncompliant patients.

Patient Care

The Eye Diseases Prevalence Research Group reported that approximately 1 in 28 Americans over age 40 years is diagnosed with low vision or blindness. It also predicted that by 2020 the number of blind and low-vision persons in the United States will increase by 70% to 1.6 million. The loss of vision in both eyes is associated with a reduction in quality of life and functional activities of daily living.^{5,6}

This gentleman has numerous problems affecting his vision. His diabetes has affected his eyesight and he needs laser treatment as well as better control of his diabetes. He additionally has vision loss due to his chronic open-angle glaucoma, and treatment options include topical medications as well as possible surgery in this noncompliant patient. The cataracts are also causing visual disturbance, but all of his comorbidities must be taken into consideration when planning his treatment. Before tackling the cataracts, the ophthalmologist needs to control the intraocular pressure and refer the patient to his internist to improve his diabetic control. Presenting the patient with treatment options and including him in the decision making are important in gaining his confidence. This patient needs to understand the severity of his condition while being allowed to take control of his condition.

Medical Knowledge

The ophthalmologist gathered past medical information from his former ophthalmologist and internist. He initiated glaucoma treatment after he had consulted with the internist to make sure there was no contraindication to the glaucoma medications he wanted for trial. A refraction improved the patient's vision so he would now be able to read the road signs and be legal to drive in his state. The referral to the internist prompted the institution of tighter glycemic control for this patient and more frequent monitoring.

Interpersonal and Communication Skills

The patient was instructed in the use and instillation and the importance of his eye drops. He was instructed to keep a record of the actual times he took his medicine. Time sheets for documenting this information were reviewed, and the patient and his wife were made participants in his care. The importance of this

participation was conveyed to the patient as well as the importance of the record keeping. On his return visit to the ophthalmologist, staff reviewed his medication sheets with him and demonstrated the importance of compliance. All of the patient's questions were answered.

Professionalism

The physician took the time to address the patient's concerns and explain his comorbidities and the relationship between his compliance and vision loss. The patient was educated, not lectured. The physician made sure the patient understood the importance of taking his medications as well as the side effects of the medications. The physician let the patient know that he understood the difficulties the patient faced and challenges he had ahead of him and tried to be sensitive to the patient's needs. This communication leads to a more compliant patient.

Systems-Based Practice

There is a significant economic burden attached to vision loss in adults. The economic burden in the United States is estimated to cost annually approximately \$51.4 billion.⁷ These costs include direct medical costs such as outpatient services, inpatient services, prescription drugs, vitamins, and other medications used by people with AMD, cataract, diabetic retinopathy, glaucoma, or refractive error. Also included are nursing home care for those with a visual impairment and government programs for the visually impaired (i.e., Department of Education's Independent Living Services for Older Individuals Who Are Blind as well as many other programs). Many other variables were factored in, such as informal care costs, quality-of-life adjustments, and lost productivity for people who are visually impaired or blind, including lower wages compared to those in the same age group who have normal vision.⁸

The ophthalmologist established communication with the primary care doctor. The patient knew he had a team working for him and did not want to let them down. Any changes in medications from the ophthalmologist and changes in the retinopathy were shared with the patient's primary care medical doctor. Working as a team and communicating with each doctor involved in the patient's care provided a support system for the patient.

Case Resolution

The patient was treated for his glaucoma with topical medications. His cataracts were removed to improve his vision and to enable better visualization of his retina, for treatment of his diabetic retinopathy, and improved assessment of his

retinal changes. His visual field loss from his glaucoma could not be restored but no further visual field loss occurred. His ability to function visually including driving and reading improved. He gained an understanding of the relationship of his diabetes to his ocular disease and that his vision loss was not just because he was getting older. He became an active participant in his own care and was able to regain some independence.

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Refractive Error in the Geriatric Population

Hilary A. Beaver

Case Vignette

An 88-year-old African-American male is sent by his primary care physician for retinal evaluation for diabetic retinopathy. He has had worsening diabetes control requiring insulin therapy. He moved to the area after the death of his wife, who had been his primary caregiver, and is currently living with his daughter. He has not seen an eye care professional in the last 12 years. His past medical history is significant for diabetes and hypertension, both diagnosed at the time of a stroke 5 years previously and both currently controlled. A diabetic nurse is working with the patient on diabetic nutrition and insulin administration, but has doubts if the patient can see well enough to accurately draw up his own insulin. The daughter travels frequently for work and has additional concerns that the patient cannot ambulate unassisted in her dark basement apartment. She is pursuing nursing home placement to gain assistance with her father's medication and his general care. He has been active with his hobbies of wood working and cabinet work but has been less and less able to pursue these activities. He is quite distressed by the loss of these activities.

On evaluation the patient sees 20/100 OD and 20/80 OS at distance and reads J7 in each eye at near. The technician performs a manifest refraction starting with the patient's current glasses prescription but gets little improvement. The external, pupil evaluation, motility, confrontation fields, and tonometry exams are normal. The slit lamp exam shows mild nuclear and cortical cataracts, and the fundus exam shows mild, nonproliferative diabetic retinopathy OU. The optic nerves are pink bilaterally, and the cup to disc ratio is 0.3 OU.

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Myopic patients may read quite well without spectacle correction and may elect to reserving the use of glasses for distance viewing.

Source: Reprinted with permission from the Department of Ophthalmology, The University of Iowa Carver College of Medicine



Patient Care

Visual disturbance is a significant cause of impairment in the very elderly, those aged 85 and older, ranking third in prevalence after arthritis and heart disease.¹ Recent studies show 3.6 million individuals, or 18% of people over the age of 70, to be visually impaired. The absolute numbers of the visually impaired elderly will grow with the aging of the US and world populations. Although there is an increase in ocular pathology with age, including diabetes, cataracts, macular degeneration, and glaucoma, the leading diagnosis for isolated vision loss in this population is refractive error (91.5%).² Visual acuity screening by primary care practitioners therefore remains a recommended geriatric screening tool for general eye health and visual function. Acuity testing uncovers undiagnosed refractive error, cataract, and macular degeneration and is currently felt to be used appropriately in the primary care evaluation of geriatric patients.³

Loss of visual acuity in the elderly can affect both quality of life (QOL) and participation in activities of daily living (ADL). Visually impaired elderly are twice as likely to have trouble with walking, transferring to a bed or chair, preparing meals, managing medication, and leaving the house. Visual difficulties with ADL create social isolation, depression, and anxiety. The visually impaired elderly have more comorbidities with falls, hip fracture, hypertension, heart disease, and stroke. Combining vision and hearing loss affects an additional 8.6%, or 1.7 million elderly, exacerbating further both functional difficulties and social isolation.² Although decreased vision from uncorrected refractive error can be as disabling as vision loss from noncorrectable causes, it is easily remedied with spectacles. Patients who have additional comorbid eye disease may also benefit in maximizing their daily activities by correcting any coexistent refractive error, both for distance and for near tasks.

Bilateral loss of vision has an even greater effect on the QOL and on life expectancy than does unilateral vision loss. Patients with bilateral loss of vision are less mobile, less likely to participate in either activities of daily living or any visually demanding task, and have worse self-rated health. A self-imposed isolation ensues as patients withdraw from social and religious activities. These bilaterally visually impaired individuals depend more on family and community assistance and are more likely to be in an institution. They suffer greater rates of recurrent falls, fractures, depression, emotional distress, and death than patients with monocular vision impairment. Vu found that unilateral visual impairment was related to falling, poor general health scores, emotional difficulty, social limitation, difficulties with visual ADL, and dependency, but noted that bilateral impairment increased the likelihood of dependency, nursing home placement, and emotional difficulties. Bilateral visual loss amplified difficulties with visual tasks 6- to 41-fold.⁴

Medical Knowledge

The aging process affects multiple parameters of visual acuity. The vision of the elderly may drop significantly with mesopic conditions or with glare (Table 1). Both contrast sensitivity and color vision are known to decrease with age, particularly the discrimination within both dark shades and pastel colors. Difficulty adapting to changing light levels presents a hazard when navigating even familiar environments. The useful field of view (UFOV) is the area of field in which one can recognize and react to visual stimuli. The UFOV declines in the elderly as does the reaction time to items within the UFOV.⁵ The UFOV is helpful in predicting functional impairment with driving and has been shown to correlate with the previous 5-year history of MVA in glaucoma patients.⁶

Table 1 Age-related median acuity in variable light conditions: 900 patients (data derived from Watson et al.⁵)

Age	High-contrast acuity	Low-contrast high-luminance acuity	Low-contrast low-luminance acuity	Low-contrast, glare conditions acuity
Youth	20/20	Little change	Little change	20/30–20/40
82	20/30	20/55	20/120	20/160

Refractive error is a significant cause of vision loss throughout the world. The World Health Organization (WHO) 2004 world estimates show 153 million people over the age of 5 to be visually impaired from uncorrected refractive error, including 8 million blind due to the lack of corrective eyewear. Ninety-five million of these individuals are over the age of 50, including 6.9 million of those legally blind from refractive error, sometimes as a result of surgical aphakia or inadequate pseudophakic correction. The WHO defines visual

impairment from uncorrected or inadequately corrected refractive error as “visual acuity of less than 6/18 in the better eye that could be improved to equal to or better than 6/18 by refraction or pinhole.” Uncorrected refractive error by this definition is therefore the current, predominant world cause of visual impairment (49%) and is the second most common cause of world blindness (18.2%).⁷

Presbyopia is not currently included in the WHO evaluation but affects many elderly individuals. Sherwin et al. studied a population in the rural Rift Valley, Kenya and found 85.4% of the patients over age 50 to have functional presbyopia, with only 5.4% having access to glasses, predominantly due to cost. The functional impact of uncorrected presbyopia on this population included difficulty reading, sewing, recognizing small objects, and harvesting grains, and illustrates the importance of near correction both for literate and for illiterate communities.⁸

Access to affordable health care is considered a particular problem in developing countries; the 2010 goal by the WHO for sub-Saharan Africa is to have one refractionist per 100,000 people.⁸ The elderly in first world nations have better access to health care providers, but continue to suffer correctable vision loss as well. Correctable refractive errors affect almost one-third of individuals aged 40 or older in the United States, Western Europe, and Australia.⁹ The Beaver Dam Eye Study found hyperopia in 49% and myopia in 26.2% of patients 43–84 years of age, with a statistically significant hyperopic shift with age.¹⁰

Many individuals in developed world nations also have uncorrected or suboptimally corrected refractive error. The National Health and Nutrition Examination Survey 1999–2002 showed that 59.5% of visual impairment in the US population aged 60 or older was due to uncorrected refractive error.¹¹ The Baltimore Eye Study of 5300 east Baltimore patients found 54% to have significant uncorrected refractive error, improving their vision by at least one line, while 7.5% improved by at least 3 lines.¹² The Melbourne VIP study, a population-based study of 2530 Melbourne adults aged 40 and older, found correctable vision loss in 84 of 159 participants with bilateral vision loss (53%) and 165 of 302 participants with unilateral vision loss (55%).⁴ The problem exists even in elderly patients who live full time in a controlled care environment. A 1994 study found 34% of elderly residents in residential care homes in the United Kingdom to have significant yet uncorrected refractive errors.¹³ Stoll et al. showed in 1963 that 60% of chronic geriatric mental hospital inpatients in Michigan had significant, unrecognized refractive error.¹⁴

Refractive error affects daily function, ADL, and QOL indicators. Vision loss from uncorrected refractive error affects QOL indicators of the National Eye Institute Visual Function Questionnaire (NEI_VFQ-25) to levels similar to cataract. Self-reported function in the NEI-VFQ-25 scale scores are significantly decreased in general vision, near vision, distance vision, driving, ocular pain, role difficulties, dependency, social functioning, and mental health.¹⁵

Correcting the unrecognized refractive error has been shown to significantly improve patient’s self-reported QOL indices. Owsley et al. found that correction

of even a modest amount of myopia and hyperopia can improve self-reported skills of general vision, reading, psychological distress, activities, hobbies, and social interaction and can significantly decrease depressive symptoms.¹⁶ Coleman et al. showed a similar improvement in NEI-VFQ composite scores in self-perception of general vision, distance vision, near vision, and mental health.¹⁷

Interpersonal and Communication Skills

The effect of age-related changes in acuity and visual field may be minimized with the appropriate spectacle prescription, even in patients with ocular comorbidities. The specific visual goals of the patient and family should be addressed while recommending these optical options. For example, the patient with trouble ambulating may do better in single-vision distance glasses without a bifocal, allowing them a clear view of the floor and any obstacles. They should also be offered separate reading glasses for near work, or the option of a bifocal for distance and near viewing while seated. In contrast, the patient who has no trouble ambulating but has difficulty with needlework or model building might improve their craftsmanship with a pair of single-vision near glasses with stronger magnification than worn in their standard bifocal. The elderly patient active in cabinetmaking should be given a prescription for safety glasses to protect their eyes while filing, grinding, and hammering.

Professionalism

Treating eye diseases in the geriatric patient requires a subtle shift in the delivery of medical care. What may be an inconvenient visual limitation to a younger patient may prevent an older patient from living independently. Low-vision rehabilitation services early in the course of disease may prevent permanent loss of function, depression, and exacerbation of preexisting dementia, issues expanded elsewhere in this text. The correction of refractive error in the elderly may require a more prolonged process, with both streak retinoscopy and refraction, but the potential benefit to the individual is significant. Recall that there is no formula that differentiates physical age from chronologic age. Elderly patients should be evaluated and treated based on their visual function and their QOL.

Systems-Based Practice

The economic burden of vision loss and correctable vision loss in the United States is staggering and is expected to rise. Thirty-eight million adults over age 40 have vision-related illness in the United States, with an anticipated 50 million affected by the year 2020.¹⁸ Estimates of the cost to the US economy vary from

\$35 to \$51 billion annually and include direct medical costs, related costs such as dependency needs, institutionalization, lost QOL indices, increased risks of comorbid disease and mortality, and an estimated \$8 billion in lost productivity.^{18,19} The direct medical cost of refracting and providing glasses for the estimated 9.2 million patients 65 and older in 2004 was estimated to be \$1842.14 million.¹⁹ The social and economic benefits of rehabilitating these elderly is likewise significant and will rise with the aging population. Visual impairment increases the risk of frequent falls by a factor of 6 and the risk of institutionalization by a factor of 4; blindness increases institutionalization by a factor of 10 compared to sighted individuals.¹⁸ Sixteen percent of visually impaired and 40% of legally blind seniors aged 65 and older live in nursing facilities compared with only 4.3% of their peers.¹⁹ The numbers of extreme elderly (aged 85 and older) will be seven times larger in 50 years than in 1980.¹³

Scenario Resolution

The clarity of the fundus examination and the view of the cataracts do not appear to match the patient's manifest refraction. The clinician performs dry retinoscopy and a subsequent refraction that yield an acuity of 20/30 OU. There is a large difference between the patient's current glasses and current refraction. Upon further questioning, the patient states that his own prescription glasses were lost several years ago. His current glasses belonged to his wife, and he uses them as a simple magnifier.

The patient is placed in trial frames for distance and near in the office and is able to comfortably read the print in an office magazine. He navigates in the office setting without difficulty, finding and returning from the bathroom without assistance. He is given a prescription both for a bifocal and for a separate pair of distance glasses for walking. The diabetic nurse subsequently teaches him to draw up his own insulin and to administer his own medication. He initiates a move to a south-facing, ground-floor apartment above his daughter and is successful in living independently. He has returned to wood working and wears his safety glasses.

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Cataracts and Cataract Surgery

Hilary A. Beaver

Case Vignette

An 80-year-old lady is brought in by her son for continuing care of mild non-proliferative diabetic retinopathy, cataracts, and geographic atrophy. She is a well-established patient and is familiar with the physician and the office staff. The ophthalmic technician notes that the patient required more assistance than usual to navigate to the exam chair. The son remarks that his mother had recently moved to an assisted living center and feels that she is less involved with visually oriented tasks and is more socially withdrawn despite what he considers expanded social and occupational opportunities at the living center. The patient initially denies any problems, but after some discussion admits she has had increasing difficulty watching television and ambulating. She denies being sad or depressed as a cause of her social isolation but states her activities are impacted because her vision seems worse. The patient is apologetic about “complaining” and wary because her own mother had a poor outcome from cataract surgery years previously.

On evaluation, her objective visual acuity is stable at 20/250 and 20/100. Her responses are more hesitant than in her past visits. Her exam reveals progression from 2+ to 3+ nuclear cataracts with stable, moderate geographic atrophy OU and mild nonproliferative diabetic retinopathy OU.

Patient Care

The patient care domain for cataract surgery includes the election of and timing of surgery, the eye selected for surgery, and the option to pursue cataract extraction in the second eye. The clinician needs effective communication with both the patient and the family to gather the information needed to make the decision for surgical intervention. Good communication defines the

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New technology allows more accurate calculation of intraocular lens power, decreasing the patient's postoperative spectacle dependence.

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patient's needs and wishes as well as their current level of visual function. It is important to evaluate patients based on their functional ability and their desire for improvement, not on their chronologic age. Ageism, the tendency to limit access to care due to chronologic age, may come from the practitioner, the family or caregivers, or the patient themselves. Some elderly attribute their social isolation and declining involvement in activities of daily living (ADL) to age and not to disability or depression and thus may not seek needed medical assistance.

The current recommendations for the timing of cataract surgery are based on patient's self-reported difficulty with daily activities. Vision loss from cataracts has historically been measured with high-contrast Snellen acuity. Other factors such as contrast sensitivity, depth perception, binocularity, glare, and mesopic acuity have been shown to affect ADL and are currently accepted criteria in the decision to perform cataract extraction.¹⁻⁴ In fact, contrast sensitivity has been proven more sensitive than Snellen acuity in detecting functional visual problems. Multiple studies show an effect of contrast sensitivity on activities ranging from postural stability to flight simulation.³ Contrast sensitivity is influenced by many age-related eye disorders. These conditions include not only cataract, glaucoma, and macular degeneration, but also spherical aberration induced by age-related lenticular curvature changes.³

The current recommendations for cataract surgery are therefore not limited by a specific visual acuity. A patient should perceive problems in their visual function or daily activities that are consistent with their cataract. They should be able to physically tolerate the procedure and should want to improve their vision by surgical means. If the patient meets these recommendations they are a reasonable surgical candidate, independent of their chronologic age or Snellen acuity.^{1,2}

It is important to document a patient's problems with ADL. There are several patient questionnaires designed to determine functional visual disability. The more extensive National Eye Institute Vision Function Questionnaire

Table 1 Summary of 25 areas covered by the VFQ-25^{5,6}

General ratings
• Overall health
• Eyesight
• Concern about eyesight
• Experience of periocular discomfort
Troubles caused because of vision
• Difficulty with ordinary print
• Difficulty with hobbies and near activities
• Difficulty finding objects on a crowded shelf
• Difficulty reading signs
• Difficulty navigating uneven terrain
• Difficulty seeing peripheral obstacles
• Difficulty reading nonverbal cues in others
• Difficulty selecting clothing
• Difficulty engaging in social situations
• Difficulty going to entertainment events
• Effect on frequency and ease of driving
• Effect on driving at night, or in weather, traffic, or unknown environments
• Difficulty reaching goals because of vision
• Difficulty with duration of work or activities
• Difficulty with periocular pain or discomfort limiting activities
• Influence on likelihood to stay at home
• Influence on frequent frustration
• Effect on loss of control over activities
• Reliance on what others tell patient
• Reliance on others for help
• Concern will embarrass self or others

was abbreviated to a 25-item questionnaire (VFQ-25) that has been extensively studied for cataract and other ocular conditions and is summarized in Table 1. The VFQ-25 is translated into nine other languages, including Japanese, Turkish, and Italian, and also exists as the VFQ-25 plus appendix (VFQ-39).^{5,6} This questionnaire is a public document, developed by RAND, funded by the NEI, and available without charge to researchers provided the source is cited.⁶ The VFQ-25 measures not just visual function on the ADL, but also the social and emotional impact that the vision has on the patient's global health. Loss of visual function on the NEI-VFQ has been proven to correlate with dense nuclear sclerotic cataract, and also the need for cataract surgery.⁵ Interestingly, the scores do not progress statistically with the progression of the density of cataract, suggesting that even milder forms of cataract can significantly interfere with visual functional.⁷ The VFQ-25 and scoring instructions are available in English, Spanish, and Greek at http://www.rand.org/health/surveys_tools/vfq/. A separate 19-question survey, the Activities of Daily Living Scale (ADVS), measures difficulty with specific visual tasks and was designed to evaluate cataract surgical candidates.⁸

Although cataract surgery is an elective procedure, there are situations in which the physician can preferentially promote surgery over observation. The patient should be informed that in some cases there are increased risks inherent to observation. For example, a patient with an unusually narrow anterior chamber angle but with retention of moderately good vision may progress to phacomorphic glaucoma even after peripheral iridectomy. The more narrow the anterior chamber becomes, the more technically challenging the procedure and the higher the likelihood of corneal decompensation. The angle and anterior chamber may continue to narrow with progressive lens growth, and it may become necessary to encourage cataract extraction despite good vision and lack of functional complaints. A similar situation is seen with pseudoexfoliation cataracts. Although the majority of patients with pseudoexfoliation have uncomplicated surgery, there is potential for increased surgical difficulty with increasing lens density and worsening zonular loss. Although lens extraction remains an elective procedure while the patient is functionally asymptomatic, in symptomatic cases with an undecided patient the practitioner can discuss the potential for increased future surgical risk with continued observation.

The preoperative surgical discussion includes documentation of the patient's preferred DNR status and their designated Medical Power of Attorney. Both the patient care and the professionalism domains for cataract surgery in the elderly allow the clinician to share their past professional experience and their clinical judgment on the patient's particular situation. Keeping abreast of the scientific literature allows the clinician to better educate the patient and the family on their care options. By recognizing and respecting the limitations of their own surgical experience and abilities, the clinician will provide better medical and surgical care in a more efficient and competent manner.

Preventative care and maintenance of health are important patient care parameters. Involving the patient's family practitioner and anesthesiology preoperatively addresses the unique needs of compromised elderly patients. The family and the residential care facility nursing staff are also part of the perioperative team and can address issues in postoperative compliance with medical treatment and follow-up. These preemptive efforts will coordinate the patient's perioperative medical regimen and recovery and allow a seamless transition of care. Finally, the clinician can consider referring elderly patients with limited vision potential for a postoperative low-vision rehabilitation evaluation in order to maximize the final visual function for the patient's desired activities of daily living. All of these components work in concert to meet the overall goal of patient centered care.

Medical Knowledge

The literature describing the effects of cataract on ADL in the elderly is compelling. These studies show that the loss of visual function from cataracts negatively affects quality of life measures similar to chronic systemic disease.⁹

Early cataracts decrease performance-based visual function, and self-assessed visual function becomes more compromised with age.¹⁰ Increasing age and poor visual function are independently associated with the loss of independence, including the avoidance of night driving and nursing home placement. Elderly patients with poor vision are more likely to have falls and fractures, suffer from a fear of falling, and need walking aids.¹¹ Decreased visual function has been shown to decrease visual confidence, socialization, and quality of life indicators.¹²

It is important to discuss the benefits of cataract extraction in older patients with visual disabilities. Surgical intervention for cataracts is known to increase visual function and independence. First eye surgery in patients with bilateral cataracts has been shown to improve visual function (reading, IADL) and to decrease vision-related disability. Patients who improve their reading vision postoperatively also show improvement in their depression scores.¹³ With the significant effect of cataract on visual function and the general good results of cataract surgery, cataract extraction has become the most common procedure performed worldwide among the elderly.^{14–16}

Although the outcomes of cataract surgery are overall favorable, results may vary by technique. Surgical success rates range in clinical studies from 50 to 95%,^{16,17} with up to 89% of patients benefiting from improved quality of life.¹⁸ A recent meta-analysis of randomized control trials found a spectacle-corrected visual acuity of 6/9 or better in 91% of individuals undergoing phacoemulsification and in 86% undergoing extracapsular cataract surgery (ECCE). Extracapsular surgery is increasing in developing nations due to a decrease in intracapsular surgery and an increase of manual sutureless small-incision extracapsular cataract surgery (SICS).⁴ One recent prospective, randomized trial showed that phacoemulsification and SICS provide equal immediate and long-term surgical outcomes, though SICS was significantly faster, less expensive, and less dependent on technology.¹⁹

Interpersonal and Communication Skills

The doctor and elderly patient relationship optimally includes the patient's family. The technical office staff are an invaluable resource for useful observations on the patient's visual functional status and general well being. Because the contribution of cataract to vision loss is incremental and progressive, patients have difficulty differentiating the gradual limitations in ADL due to cataract from those due to other aspects of aging. As a result, elderly patients may downplay the contribution of cataract and may be slow to pursue an elective surgical correction of their vision. The family may be more objective and are often better able to observe a change in visual function and ADL. These observations include a decrease in the ability to drive, to navigate uneven terrain, travel to social functions, and to engage in favored activities such as reading, working puzzles, and

watching television. The family thus may be the first to report a decline in visual function and are a helpful addition to the patient visit. When present, they can review the physician's recommendations with the patient.

The eye practitioner is uniquely able to evaluate the ocular contribution to an elderly patient's functional decline. The functional effect of vision loss is intertwined with a potential senescent decline in stamina, attention level, mental function, and general interest. There may be a coexistent decrease in cognitive activities due to depression or dementia. The ophthalmic surgeon can consider alternative causes for a loss of visual interest, particularly if the level of vision measured on exam would not prohibit involvement in previously enjoyed visual pursuits. The alternative causes of a decline in activities can be pursued in coordination with the primary practitioner, and in some cases with formal neuropsychologic testing. One simple office test for dementia is to have the patient perform a clock drawing or to verbally interpret a complex visual scene.²⁰ The effect of and diagnosis of cognitive decline is further discussed in the section of this book on depression and dementia. The ophthalmologist's final decision for surgery must weigh the often conflicting reports of visual disability from the patient, the family, and from other caregivers, as well as from changes in the patient's eye examination.

Professionalism

Cultural, gender, and age-related differences affect the patient's perception of and use of the medical system, including their access to and pursuit of elective ocular procedures. One generational difference is seen in those elderly patients who grew up during World War II and the Great Depression. This elder generation of patients may be reticent about complaining about postoperative pain or accept pain management.²¹ They may likewise view pursuing a functional ocular limitation as "needless complaining." These patients have different expectations than the more medically and technically savvy post Baby Boomer generation. The elderly may also base their own outcome expectations upon their parent's surgical experiences from years ago, and may require additional chair time to dispel these fears. Although finding the additional time for an extended discussion with the reticent or confused elderly is difficult with today's rapid clinic patient turnover, professionalism requires placement of the patient's needs for education before the doctor's needs for efficiency.

Practice-Based Learning and Improvement

The adept clinician will practice self reflection, and constantly improve their own practice by critically reviewing and assimilating relevant material from the medical literature. This includes being aware of the specific population that they

serve and applying to that population an understanding of the effect that cataracts have on the elderly locally, nationally, and internationally. It is likewise important to recognize the risk factors for and interventions against the development of cataract, and the risks and benefits of cataract surgery in patients with comorbid eye disease.

Cataracts continue to be a leading cause of vision loss from the first world to the third world. A recent review of cataract epidemiology by Abraham shows that cataracts cause 47.8% of the world's 37 million blind, with 82% of cataract blindness occurring in those 50 years and older.^{4,17} Although 90% of those blind from cataracts live in developing nations, cataracts continue to be the leading cause of low vision both in US nursing home patients (37% of white and 54% of African-American subjects) and in other developed countries (78% of low vision in the Netherlands).¹⁷ The incidence of cataract is rising globally as the population ages. The world estimation of 20 million blind in 2007 is expected to rise to 40 million blind in 2020.^{4,15,17} There is therefore great interest in preventing cataracts, as delaying the onset of cataract formation by 10 years could decrease the need for surgery by 50%.¹⁷

There are a number of cataract risk factors that can be modified. Smoking is associated with nuclear sclerosis [NSC] and posterior subcapsular [PSC] cataracts, diabetes with cortical opacities [CO] and PSC, UV light exposure with CO and PSC, and myopia possibly with all types of cataract. Oral corticosteroids are linked to PSC cataracts, and to a lesser degree are inhaled steroids.⁴

Vision loss from cataracts is also related to gender and age. Women are more likely than men to lose vision from cataracts when age matched, though worldwide surgery is often provided preferentially to men.⁴ The incidence of vision loss from cataract is known to increase with advancing age. Postmenopausal hormone changes, genetics, and serum markers of inflammation are all under investigation for their role in cataract formation. Finally, there is conflicting data on the role of antioxidants and cataract formation. Studies of nutritionally deprived populations are currently ongoing.¹⁷

Comorbid eye disease can significantly impact the risks and the benefits of cataract surgery. The clinician can use advances in technology to facilitate access to the medical literature about ongoing studies and techniques to maximize the outcome in at risk eyes. This new knowledge will optimally be used to educate not only themselves, but also their patients and their ophthalmic colleagues. The physician should draw on their past experience of treating patients with similar comorbid diseases, intertwining this with the literature evaluating cataract surgery in patients with multiple ocular diagnoses. They should use this information to continuously update their surgical and medical practice and counsel their patients with comorbid disease.

Gray et al. found comorbid eye disease in 39% of British cataract patients, including glaucoma in 14%, age-related macular degeneration in 13%, and diabetic retinopathy in 4%.¹⁵ Naeim et al. showed that cataract extraction was beneficial and cost effective in 75% of patients who preoperatively were felt to have less than 30% chance of benefiting from surgery. The benefit and cost

effectiveness of cataract surgery in these patients were measured comparable to influenza and pneumococcal vaccination in patients over 65 years of age, lovastatin for cholesterol reduction, and radiation after breast-conserving surgery.¹⁶ The outcomes of these studies overall support the performance of elective cataract surgery in patients with visual limitations, despite the presence of other eye conditions that may limit their expected improvement.

Systems-Based Practice

The national financial costs of cataract surgery in the elderly population are high; the benefits both to the individual and to society are likewise significant. Cataract extraction is the most common surgical procedure performed on patients 85 and older.¹⁹ In the 1990s, 60% of Medicare expenditures was spent on cataract surgery and related care, costing \$3.4 billion annually.^{17,22} The economic benefits of cataract surgery outweigh the financial costs of surgery, however. The savings occur in quality-of-life improvement for the individual as well as in the release of family care duties for relatives of the visually impaired.^{4,15} The demand for cataract surgery thus continues to rise both in the United States and abroad.^{14,15,17}

There is interest in the United States and abroad to determine the cost effectiveness of second-eye surgery. One-third of all cataracts removed in the United Kingdom and 30–45% of cataract surgeries performed in the United States are second-eye surgeries. Recent recommendations support improved patient outcomes with rapid, successive surgeries.^{15,22} Second-eye visual impairment causes poor binocular acuity, stereoacuity, and even abnormal motion perception; one cataractous eye can induce binocular inhibition of the visual input from a pseudophakic, rehabilitated first eye. Second-eye surgery dramatically improves both self-assessed visual function and stereoacuity,²² decreases self-assessed visual impairment, and improves not only mobility but also routine daily and leisure activities¹⁴ in levels comparable to first eye surgery.¹⁵ Current research therefore supports second-eye surgery assuming that the same difficulties with visual function and quality of life indices are met as with first eye surgery.^{15,22}

Finally, there is interest in the effect of cataract surgery on both the mental health function and the physical well-being of elderly patients. Gray et al. reviewed several studies that looked at the effect of cataract surgery in dementia and depression. They found an improvement in the patient's perception of their health and a decrease in anxiety and depression simply from scheduling the patient for cataract surgery. There are improvements in MMSE scores post-operatively in both first- and second-eye surgeries in patients who did not have significantly depressed initial MMSE. Some additional studies have showed an improvement in cognition, though others showed no improvement in depressive symptoms.¹⁵

Cataract surgery can likewise affect the physical well-being of the patient. Studies have demonstrated that 25% of patients over 65 years old fall yearly and that visual impairment (by decreased acuity, contrast sensitivity, visual field, PSCC, and nonmiotic glaucoma medication) contributes to falling.¹² First- and second-eye cataract surgeries in elderly patients with cataract-related visual loss have been shown to significantly decrease the postoperative risk of falls. Risk factors that amplified the risk of falling preoperatively were older age, use of more than four medications, and a past fall, though these risk factors were nullified after cataract surgery.¹² Alexander et al. hypothesized that earlier second-eye surgery (1 month) would decrease the fall rates compared with the then standard surgical timing of the second eye (1 year). Although this study did not reach enrollment due to changes in second-eye timing policy, there were statistically significant improvements in visual function (acuity, contrast sensitivity, stereopsis), in patient confidence regarding falling, and in existing visual disability.²³ It is unfortunate that despite all the benefits of cataract surgery in the elderly, the access to medical care, insurance status, and ability to speak English still all affect the rate of appropriate cataract surgery in the United States.¹⁷

Case Resolution

The family involvement in this clinical case proves to be very beneficial to the patient. The son accompanies his mother on this visit and provides an accurate and objective assessment of his mother's declining visual function. He reminds his mother of her past interests, leading into a lengthy discussion with the clinician on the option of cataract surgery. The clinician shares their past observations of the outcomes of other patients with similar comorbid ocular conditions, the recommendations of the medical literature, and the anticipated limitations of best corrected vision due to the patient's degree of macular degeneration. She is reassured in the potential visual benefits despite her expected limitation of vision. The clinician reviews the many advances in surgical technique since the patient's mother's procedure, reassuring her fears about the surgery and the postoperative care period. The patient defines her goals to be improved contrast sensitivity, ambulation, and brightness. She chooses to try her best eye first, claiming that "the other one isn't worth anything," and becomes very enthusiastic about proceeding rapidly to surgery. The ophthalmologist contacts her primary care physician, arranging for them to maximize her diabetic and hypertensive control preoperatively, and additionally sends preoperative information to the skilled care facility where she lives.

The patient undergoes uncomplicated cataract extraction with lens implantation. She subsequently proclaims that her vision is "100 percent improved" at 20/80, including both improved brightness and increased clarity of vision. Her son interjects that she has spent more time watching television and has become

involved with a local coffee group. She elects to proceed with her second eye, feeling it is now relatively “dim and yellow vision” when compared with her pseudophakic eye. The physician discusses the benefits of second-eye surgery and the anticipated improvement in her daily function over unilateral cataract surgery. They arrange for her to see a low-vision consultant postoperatively, as she hopes to acquire a closed circuit low-vision device for use at the living facility.

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Glaucoma in the Elderly

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Case Vignette

An 85-year-old Latin American female presents for evaluation after an increased intraocular pressure was detected at a community screening for glaucoma. She has a past medical history of severe degenerative arthritis in her hands and suffers from stable angina. Though widowed, she lives independently near her family; she has declined previous suggestions to move in with them or to the local retirement center. On examination the patient has 20/20 visual acuity OU, an increased intraocular pressure (IOP) of 28 mmHg OU (Fig. 1), glaucomatous cupping of 0.6 OU, and a confrontation visual field followed by formal perimetry showed a superior arcuate glaucomatous defect OU (Fig. 2). At that point, her eye doctor begins a one-eyed trial in the right eye (OD) of timolol GFS 0.5% each morning.

On follow-up evaluation, the patient reports perfect compliance. She reports intermittent blurred vision after placing the new medication. She mentions also a baseline intermittent dizziness due to low blood pressures and thinks this may be increased with her new therapy. Although she last placed the timolol at 7:00 AM, her intraocular pressures on examination are unchanged and still elevated from her initial appointment, and are equal OU. After questioning, she confirms lid closure and punctual occlusion for 5 minutes after each drop.

Her daughter is present for the current exam and reports that she has witnessed the patient both remembering to take her medication and instilling the drops. When asked to apply an additional drop in the office, the patient elevates her eyes, positions and squeezes the bottle, closes her eyes and correctly applies correct punctual occlusion. She and her daughter are unaware that the process failed to squeeze a drop out of the bottle and into the eye.

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Fig. 1 Slit-lamp evaluation of the anterior chamber. Source: Reprinted with permission from the Department of Ophthalmology, The University of Iowa Carver College of Medicine

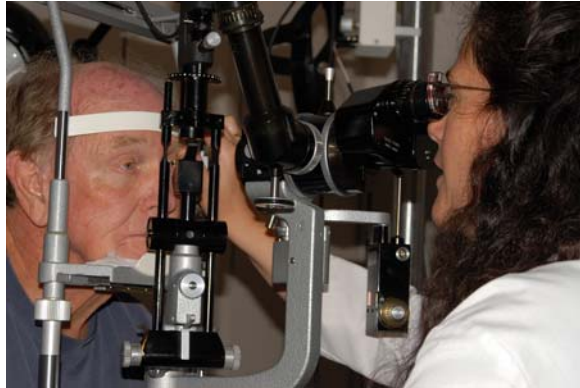
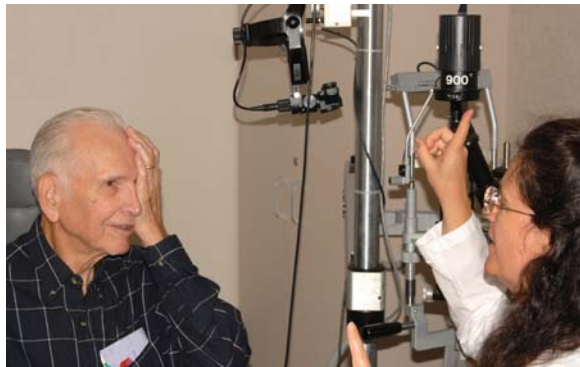


Fig. 2 Confrontation visual-field testing. Source: Reprinted with permission from the Department of Ophthalmology, The University of Iowa Carver College of Medicine



Patient Care

The incidence and prevalence of glaucoma increase with advancing age. Although glaucoma is often asymptomatic until advanced, the disease can have devastating visual and functional consequences. Glaucoma negatively affects the overall quality of life and activities of daily living in the elderly, an ever-increasing population in the United States. As the elderly are currently increasing at more than twice the rate of the general population, the population over 85 years of age is projected to be 7 times larger in 2050 than it was in 1980. Glaucoma currently affects 2.2% of Americans over age 40 and 7.7% of individuals over age 80. The total number of patients with glaucoma is thus projected to increase by 50% by 2020.^{1,2}

The likelihood of developing glaucoma is affected by race as well as age. Glaucoma is the primary cause of blindness for African-Americans and is

three to four times more common than in non-Hispanic whites. This risk is higher still in black patients originating outside of the United States. Other races are increasingly being recognized at increased risk for glaucoma as well. Glaucoma is found in up to 22% of Latinos over age 80 and causes 28.6% of all blindness in the Latin American population. In the 2000 Census, 35 million individuals (12.5% of the population) identified themselves as Latino or Hispanic.²⁻⁴

Ten percent of the elderly have undiagnosed visual disorders, many of which have glaucoma and could benefit from screening. Up to a quarter of patients over 80 with vision loss are unaware of their disease, including 7% who are blind from their disease.^{1,2} Compounding this problem, elderly patients with decreased vision may overestimate the quality of their vision, decreasing the likelihood that they will seek ophthalmic evaluation and care.⁵ Institutionalized Americans are at a higher risk, with current estimates showing 26% of nursing home residents to have visual impairments.⁶ Whereas half of glaucoma patients in America are undiagnosed, that number increases as high as 75% in Latin Americans for both open-angle glaucoma and for ocular hypertension.⁴ There is potential benefit in screening the general elderly population for common diseases such as glaucoma in order to prevent vision loss and the comorbid conditions that accompany the loss of sight. There is increasing attention to performing this vision screening at sites where the elderly congregate, such as senior living facilities, activity centers, and outpatient clinics. These screenings may be performed by traveling nurses. Although tonometry is currently one of the recommended means of glaucoma screening, and can be accomplished with relatively light and inexpensive equipment performed by minimally trained nonophthalmic personnel, it is generally underutilized as a glaucoma screening tool.¹ The benefit of such public health screening programs has been studied and has support in the literature,^{1,5} but the effect on the rates of vision-related functional impairment and effect on quality of life has been debated. The U.S. Preventive Services Task Force (USPSTF) in their review of the literature (2005) found insufficient evidence to recommend for or against screening adults for glaucoma. Although the USPSTF found “good evidence that screening can detect increased intraocular pressure (IOP) and early primary open-angle glaucoma (POAG) in adults,” and that “early treatment of adults with increased IOP detected by screening reduces the number of persons who develop small, visual field defects,” and agreed “that early treatment of those with early, asymptomatic POAG decreases the number of those whose visual field defects progress,” the overall evidence was not sufficient to determine the “extent to which screening – leading to the earlier detection and treatment of people with IOP or POAG – would reduce impairment in vision-related function or quality of life.”⁷ This has led to debate, encouraging screening specifically by eye care professionals. In response to the USPSTF paper, the American Academy of Ophthalmology (AAO) produced a response emphasizing the

new evidence for screening and the importance of the role of eye care professionals in screening. The summary of the letter is below:

- “1. There is, in fact, a clear chain of evidence that connects glaucoma screening by eye care professionals with meaningful preservation of visual function and quality of life, through the reduction of worsening of glaucoma.
2. Community glaucoma screening will result in detection of patients with meaningful loss, since most will already have significant visual field loss in excess of -4 dB.
3. Visual field loss at the -4 dB level has a demonstrable and clinically significant impact on patient visual functioning and vision-related quality of life.
4. There is documented cost-effectiveness from the societal perspective in treating this level of visual field loss.
5. Glaucoma screening, defined as including an eye examination that detects all other conditions that threaten sight in the elderly and thus will result in significant benefit for older Americans in key indicators as important as IADL's and ADL's”.⁸

The question of the cost-effectiveness in treating glaucoma is a significant one. The direct economic cost of glaucoma to the United States is \$2.86 billion annually for doctor, hospital, and drug treatment fees.² This estimate does not address the indirect costs of lost productivity, loss of quality of life, depression, institutionalization, and comorbid injury from falls and accidents. Although the geriatric population is already at risk of falling from comorbid medical conditions, glaucoma adds a significant risk for injury and falls. The loss of peripheral vision increases the likelihood that a patient will run into objects while walking, and increases the need for home modification and environmental analysis training.⁶ Haymes et al. found glaucoma patients to have a 3-fold increase in annual falls, and a 6-fold increase in motor vehicle accident (MVA) in the preceding 5 years compared to controls. Those glaucoma patients who suffered an MVA were 7-fold more likely judged at fault.⁹ The Salisbury Eye Evaluation study found visual field loss to be the primary visual indicator of an increased risk of falling.¹⁰ The same study found binocular visual field loss to be associated with a significantly increased risk of motor vehicle accident.¹¹ Adequate glaucoma treatment, maximal vision correction and rehabilitation, and fall prevention could decrease both the personal and the social costs of glaucoma in our aging population.

Medical Knowledge

Glaucoma is a significant visual disorder in first- to third-world nations. The World Health Organization projects 60.5 million people to be affected by glaucoma worldwide by 2010, increasing to 80 million by 2020. The worldwide ratio between open-angle and angle-closure glaucoma is approximately 3:1.

Most world bilateral blindness from glaucoma results from angle closure. The incidence of glaucoma begins above age 40 and increases sharply with age.¹² Glaucoma is a major cause of vision impairment in first-world nations as well and accounts for 10% of blindness in the United States. One million Americans over the age of 65 have vision loss from glaucoma; 75% of those legally blind from glaucoma are over the age of 65.³

The elderly at risk for glaucoma are also at increased risk of drug toxicity following treatment for glaucoma. Although glaucoma medications are primarily applied as topical drops, those drops are adsorbed systemically through the conjunctiva and the nasal mucosa. Drugs administered via the mucosa directly enter the bloodstream without undergoing first pass elimination in the liver. The systemic effective dose of these medications is therefore larger than a similar oral dose. All medications have an increased potential for side effects in the elderly patient. The elderly have a lower muscle-to-fat ratio, less cardiac output, and less effective renal and liver clearance. Older patients have more comorbid medical conditions, including chronic obstructive pulmonary disease (COPD), diabetes, hypertension, cardiac arrhythmias, congestive heart failure, and arthritis that can be adversely affected by the use of topical glaucoma medication.¹³ The elderly take more systemic drugs with which to interact and have lower serum albumin and other plasma-binding sites, such that there is more competition for binding and more free drug available. Therefore,

Table 1 Side effects of glaucoma medication^{3,14,15}

Medication	Side-effect profile
Alpha adrenergic agonists	Topical allergy, dry mouth, exacerbation of cardiac disease, headache, sleep or gastrointestinal (GI) disturbance, hypertension, fatigue, interaction with MAO inhibitors and tricyclic antidepressant agents
Beta-2 adrenergic agonists	Topical allergy, aphakic/pseudophakic macular edema
Beta-1 and 2 antagonists	Hypotension, bradycardia, bronchospasm (less in B-1 selective agents), fatigue/loss of exercise tolerance, exacerbation of underlying cardiac disease, masking of hypoglycemia or thyrotoxicosis, depression, impotence, syncope, headache
Carbonic anhydrase inhibitors	Topical: local allergy, stinging, oral > topical with metallic taste, GI disturbance, idiopathic aplastic anemia, metabolic acidosis, hypokalemia, paresthesias, anorexia, fatigue, kidney stones, depression, weakness, metabolic acidosis
Osmotic diuretics	Exacerbation of underlying cardiac disease, subarachnoid hemorrhage, rapid diuresis
Parasympathetic cholinergic agents	Miosis causing difficulty with dark adaptation and mesopic conditions, cataract, myopic shift, headache, GI disturbance, diaphoresis, dyspnea, hypotension, arrhythmia, weakness, bronchospasm
Prostaglandin analogues	Topical allergy, iris and eyelid pigmentation, growth of lashes, conjunctival hyperemia, uveitis, macular edema, musculoskeletal pain

elderly patients in particular should be instructed on punctual occlusion and lid closure to minimize systemic adsorption of their topical medication.

Because these elderly patients with glaucoma frequently have comorbid constitutional diseases such as arthritis they should be instructed and possibly even observed performing the correct instillation of their topical medications. Elderly patients with arthritis in their hands, peripheral neuropathy, or generalized weakness can be asked to demonstrate self administration of drops with a sample of artificial tears. Although these dropper bottles have different shapes and rigidities, this simple test can give a general confirmation whether the patient is able to self-administer drops.

Interpersonal and Communication Skills

Good communication skills are essential when interacting with the elderly but in particular the older patient with glaucoma. This includes awareness of and recognition of the unique social, economic, physical, and mental needs of elderly patients with glaucoma. For example, a frank discussion of financial resources available for medication might be needed in an elderly patient on a fixed income. The financial hardship created by an expensive branded medication might be sufficient grounds to select a less expensive or generic alternative. The clinician should consider asking the older patient specifically if they prefer generic medication over brand name therapy. In addition, elderly patients are often already dosing systemic medications throughout the day, and may prefer a topical drug with multiple dosing to paying additional money for a slow-release, single-use medication. Although patients may talk freely about this aspect of care when the subject is raised by the practitioner, they may be unwilling to broach the subject themselves.

Family members may be able to provide additional valuable information that can impact compliance. Family members may accompany an elderly patient to their appointments, and can be consulted as to the patient's compliance with medication, side effects from medication, and coexistent medical conditions. Some family communication may be nonverbal, and it may be quite helpful to keep them visible while taking a history from the patient. A family member grimacing and shaking their head may be a more helpful indicator of compliance than the patient's verbal pronouncement, and can at least raise the question for discussion with the patient about their ability to independently dose their own medication.

The clinician should strive to put the patient at ease, allowing the patient to share sometimes difficult personal information can have vast implications on compliance and care. A patient who is unable to recall their care plan or to comply with their medication may be unwilling to state this due to the implications on self reliance, self sufficiency, and the need for institutional care. Many patients with dementia retain their interpersonal and communication skills far into their disease. A clinician viewed as hurried or uninterested will not gain the

patient's confidence. It is important to recall that the patient and their family can read nonverbal cues as well. Sitting during the interview instead of standing, maintaining good eye contact, and giving the patient ample time to answer a given question will improve communication with the patient. Asking a patient to list the medication they are taking and the dosing of that medicine may be much more informative than asking them to confirm medicines read from the chart. In this age of declining reimbursements leading to more rapid patient encounters, it is increasingly important to remember the communication competency when dealing with the elderly patient.

Professionalism

Aspects of physician professionalism can affect both the eye care and overall health care of the glaucoma patient. The health care provider should recognize and respect the elderly patient's need for independence and show compassion and empathy for the psychosocial aspects of the disease, including fears of blindness and dependency. Although it is important to confirm medical compliance, it is also important to respect patient's autonomy and independence. The clinician in this setting may have to spend more time with the elderly patient with glaucoma to address any social or nonocular but age-related impediments to care. These adjustments allow the patient to retain dignity through self reliance, independence, and autonomy, but allow the option of adding additional assistance from visiting family members or from home health services.

Professionalism also includes ethics and the withholding of medical care. This might encompass the decision in a poorly controlled, elderly glaucoma patient between proceeding with surgery or continuing with suboptimal medical management. Although advanced age and comorbid medical conditions will impact patient care, the decision to treat aggressively or not should be made in discussion with the patient, and if they are not able to make the decision independently then the discussion should include their family members or other caregivers. The withholding of medical or surgical care based on chronologic age alone is not appropriate and is a form of "ageism." A healthy, spry, independent living 90-year-old may in fact be a better candidate for aggressive treatment than a frail, incapacitated, institutionalized, or terminal 70-year-old patient. It is better to outline the benefits and risks of the medical and surgical options, including the effect of advanced age on surgical outcome, and allow the patient to decide on their course of treatment.

Practice-Based Learning and Improvement

There is overlap between practice-based learning and improvement, and with the medical knowledge competencies. The clinician should stay abreast of new medical practices and apply these best practices to their own patient care. This

would include being facile with the new medicines available for glaucoma and the new surgical options for treating the disease. Most new medications have a limited number of recognized toxicities and contraindications outlined at the time of FDA approval. More of these toxicities become defined with case reports or FDA updates in the months to years after a drug is approved. The clinician should stay abreast of the literature and new drug information and apply this information to the different patient populations with whom they interact. In our scenario, this would include recognition of the special pharmacokinetics in the elderly population. Although there may not be specific contraindications in glaucoma drug therapy simply by age, the clinician should be cognizant of the interaction of comorbid disease and medication toxicity frequently encountered in the elderly.¹³

Table 2 Top questions to ask your elderly glaucoma patient

1.	Do you have asthma, emphysema, or chronic bronchitis?
2.	Do you have heart disease, rhythm problems, or heart failure?
3.	Do you have hypertension or hypotension? Do you take a beta blocker?
4.	Can you walk up a flight of stairs without stopping for breath?
5.	Are you diabetic? Do you get hypoglycemic?
6.	Would it bother you if your eyes changed color?
7.	Have you ever had inflammation in the eye (uveitis) or macular swelling?
8.	Have you had complicated cataract surgery?
9.	Are you on antidepressants of any kind?
10.	Do you have any allergies to medicines, particularly eye drops?
11.	Are you able to give yourself medication, specifically eye drops?

Systems-Based Practice

The system of care includes all facilities and individuals that a patient will encounter during the course of their therapy. In this case, the system of care includes the patient, the clinician, the family caregivers, and the skilled home health care providers that were refused by the patient. In addition, the local system of care includes the pharmacy where the patient obtains her medication, the primary care practitioner managing her hypertension, as well as her local hospital and emergency department. The macrosystem of care includes the pharmaceutical company and industries that make her medication, her insurance agent and company (in this case Medicare and the federal government), any cost-containment policies of these third-party payors, and the health policies of the county, state, and federal government. The clinician should be aware of how their own provision of care is influenced by the other components of the system of care, and how to employ those other components to the best advantage of the patient. The clinician should work within their system to provide the best quality care with the most optimal use of the limited resources of the system.

Case Resolution

In this case, observing the patient self-administer drops and improving her technique and compliance were the most important parts of the encounter. The clinician discussed with the patient and family the failure of proper drop application and the option of home health care assistance. The patient was adamant about her ability both to remember and to instill her own medications and declined attempts to arrange home health care. The clinician however brokered an agreement to allow the daughter to assist in her mother's care. The daughter lives near to her mother and has come to all of her appointments, and thus gains her mother's consent to witness the daily instillation of drops. The daughter works during the day and so cannot come in late morning, and the patient is "not a morning person," staying up at night and waking after 9:00 AM.

In this case, the clinician changed the medication to a single evening dosing of a prostaglandin analogue. Nighttime dosing of prostaglandins coordinates the schedules of the caregiver and the patient with the optimal dosing for the drug in question. The selection of a prostaglandin lessens the likelihood of postural hypotension in this chronically hypotensive lady, not only decreasing the risk of falls but also lessening the likelihood of inducing nocturnal hypotension and potential side effects such as anterior ischemic optic neuropathy. The solution format of the prostaglandin was preferable in this case as well. Gel-forming solutions can temporarily blur vision and contribute to a fall. Gels are also more difficult to squeeze from a bottle in patients with arthritis or weak finger strength.

Having reviewed the risks and benefits of the new medication and the alternatives to treatment, she is given a written prescription and a follow-up appointment for IOP evaluation in 6 weeks time. The patient and daughter are instructed to see her primary care physician for evaluation of her dizziness and for a fall prevention assessment.

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Diabetic Retinopathy and Its Management

Neil M. Bressler

Case Vignette

A 70-year-old man notes progressive problems with reading the newspaper and seeing signs while driving over the past year. His most recent examination with a comprehensive ophthalmologist was approximately 3 years ago when he was told he had some evidence of “diabetes” in his eyes. He also has a past medical history of diabetes for which he is taking an oral hypoglycemic agent, and a history of hypertension for which he is taking two medications, but he cannot recall what the medications are, and did not bring them to his examination. He is not aware what his hemoglobin A1C level is, but his reply to this question also was that he might have “a little anemia.”

On evaluation, his visual acuity was 20/40 in his right eye and 20/50 in his left eye with his glasses. A manifest refraction revealed no change to his current prescription and did not result in any better visual acuity measurement. The pupils reacted normally to light and intraocular pressures were 19 and 18 mmHg in the right and left eyes, respectively. The slit-lamp examination showed no iris neovascularization in either eye although there was some nuclear and cortical opacity in the right eye and nuclear opacity in the left eye which did not appear to account for any decrease in visual acuity. Dilated ophthalmoscopic examination of the right eye showed more than 20 dot and blot hemorrhages in one field nasal to the optic nerve and temporal to the macula. There were a few nerve fiber layer infarcts along the supero-temporal arcade, but no evidence of venous beading or intraretinal microvascular abnormalities (IRMA). The distance between the surface of the retina and the retinal pigment epithelium in the center of the macula appeared thickened, with some microaneurysms and lipid within the central macula. Dilated ophthalmoscopic examination of the left eye also showed more than 20 dot and blot hemorrhages in one field temporal to the macula, but no evidence of venous beading or intraretinal microvascular

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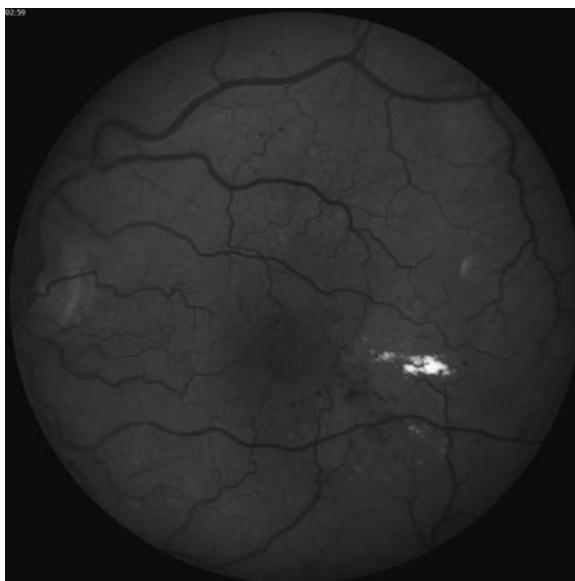
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Fig. 1a Indirect ophthalmoscopic examination of the retinal periphery. Source: Reprinted with permission from the Department of Ophthalmology, The University of Iowa Carver College of Medicine

abnormalities (IRMA). As in the right eye, the center of the macula appeared thickened with some microaneurysms and lipid within the central macula (Fig. 1a and 1b).

Fig. 1b Left fundus photograph of diabetic macular edema. Source: Reprinted with permission from the Department of Ophthalmology, The University of Iowa Carver College of Medicine



Systems-Based Competency

This vignette provides an example of many of the challenges of managing diabetic retinopathy in older people. Diabetic retinopathy is a common cause of vision loss in people over age 50 in the United States,¹ and growing in incidence

concomitant with the increasing prevalence of obesity.² Before getting to the management of the patient's retina problems from a medical knowledge competency standpoint, it is important for the comprehensive ophthalmologist to realize that he or she represents a part of an entire team of healthcare providers (nurses, technicians, the primary care physician, the endocrinologist, podiatrist, social worker, the family) who must work together with a patient who has diabetes in the management of diabetic retinopathy. Coordination of care, patient and family teaching, and insuring glucose monitoring and control require a system-wide effort that includes of course the treating ophthalmologist.

Communication Skills and Professionalism

Related to this important interaction, one of the Physician Quality Reporting Initiative (PQRI) initiatives for patients who have a diagnosis related to diabetic retinopathy, the treating ophthalmologist is encouraged to communicate with other providers of care for the patient's diabetes.

Such communication might have reduced the chance for a gap in this patient's continued eye care. The patient had not had a dilated fundus examination from an ophthalmologist in over 3 years, even though the patient reports having had some level of diabetic retinopathy identified at that last exam. Even if only mild, non-proliferative diabetic retinopathy with no macular edema was noted, the patient should have had at least an annual examination to watch for progression of retinopathy for which treatment might be indicated to reduce the risk of vision loss. There may be an increased difficulty for some older people to get to even one physician, because of multiple medical problems. This problem can be compounded for the older person with diabetes, where frequent examinations with many specialists might be necessary, including for example, a primary care provider, an endocrinologist, an ophthalmologist, a podiatrist, a cardiologist, and renal specialist.

Also of note in this patient is the potential confusion of the older patient with diabetes to be aware of which medications he or she is taking, since some of these may have an impact on the ophthalmic care, for example, on choice of ocular antihypertensive medications. Some patients might consider actually bringing their medications to the examination for accurate recording, or at least a carefully developed list.

Furthermore, this case highlights the difficulties with understanding the concept of hemoglobin A1C.³ First, this patient apparently confused the term "hemoglobin A1C" with hemoglobin and the concept of anemia. Second, although the hemoglobin A1C is a convenient laboratory value to judge control of diabetes, which is critical to reducing the chance of progression of retinopathy,⁴ this patient, as is true in many patients may not understand the concept.

Also, it is clear that this patient may not realize that the progressive vision loss is not from cataract or an incorrect spectacle correction. The physical examination indicates that his cataracts can be seen with a slit-lamp

biomicroscope but are not judged to be the cause of his recent vision loss. Older patients often may believe that vision loss is an inevitable symptom of aging rather than ascribing a specific diagnosis, such as diabetes, as the cause of visual impairment. While vision loss may become more common with age, older patients should realize that aging, in and of itself, is not a cause of vision loss. Rather, specific diagnoses, including diabetic retinopathy may become more prevalent with older age and are potential reasons for vision loss. Older patients should not just accept vision loss as an inevitable sign of aging but should pursue with an ophthalmologist what the cause of vision loss is, especially since most incidents of vision loss in older people can be treated. This is especially true for all older patients with diabetes to understand, even at a time when diabetes has been diagnosed but there is no diabetic retinopathy.

The patient also may not realize that features of diabetic retinopathy, such as macular edema, which can cause vision loss, may be present before any vision loss has occurred, but that vision loss can be prevented in such cases if focal/grid photocoagulation is initiated when the center of the macula is thickened or when edema appears to be encroaching on the center of the macula.⁵

Management of Diabetic Retinopathy in Older People: Medical Knowledge and Patient Care

The management of diabetic retinopathy in older people includes the management of two processes: (1) diabetic macular edema and (2) level of retinopathy.

Management of Diabetic Macular Edema

Macular edema represents a thickening of the retina due to intercellular and occasionally subretinal accumulation of edema. Presumably, loss of pericytes and capillary nonperfusion due to elevated blood sugar levels can lead to the development of microaneurysms and retinal telangiectasis which may allow intercellular fluid to accumulate, most easily within the outer plexiform retina, then throughout the retina, and even into the subretinal space. The edema is recognized clinically as an increased distance of the surface of the retina from the retinal pigment epithelium or by documentation of this thickening on OCT imaging.

The management of DME includes counseling or reinforcing the need to maintain blood glucose levels to as near normal levels as is possible, balanced by the risks of such treatment to achieve these levels, and doing so in a way that will encourage the older patient to recognize that managing diabetes can impact the maintenance of vision. Communication with the older patient's primary care provider or whoever is managing the patient's diabetes care or both is essential. Diabetes can involve so many specialists and the coordination of this care can be challenging for any patient. For the older patient, this coordination can be even more challenging when additional comorbidities unrelated to diabetes also

may be present. Attention to blood pressure and lipid control should be done in anyone, but a patient with diabetes can be reminded by the ophthalmologist that maintaining care of blood pressure and lipids may be associated with less diabetic retinopathy and vision loss.

The initial workup for a patient suspected of having diabetic macular edema should consist of a detailed history including any onset of metamorphopsia presumably from diabetic macular edema, or central scotoma potentially from capillary nonperfusion in the macula leading to edema. Ocular history regarding past laser treatments or intravitreal treatments should be elicited, along with kidney disease (which could exacerbate edema) and use of drugs that might be associated with edema.

Practice-Based Learning

The ophthalmological examination, as described in the AAO's Preferred Practice Pattern for Diabetic Retinopathy, should include an evaluation of visual acuity along with stereoscopic biomicroscopic examination of the macula and, if macular edema is suspected, OCT and fluorescein angiography might be obtained. OCT could provide objective quantification of the edema for comparison to future visits in order to determine whether persistent edema following treatment represents improved but persistent edema or worsening of edema (Fig. 2). Fluorescein angiography can facilitate placement of laser treatment directly (focally) to microaneurysms within areas of thickening by highlighting microaneurysms (Fig. 3), as well as placement in a grid (macular scatter) pattern to thickened areas of diffuse fluorescein leakage, and considering not placing grid to thickened areas of capillary nonperfusion. The angiogram also might identify small areas of retinal neovascularization not detected on clinical examination (see next section of proliferative diabetic retinopathy); to detect these areas, the ophthalmic photographer should consider taking images which sweep fields outside of the disc and macula (see next section on neovascular AMD).

Macular edema usually is treated if it involves the fovea or is threatening the fovea (i.e., associated with lipid in the fovea, or extending toward the fovea, e.g., extending within 500 microns of the foveal center or a large area of edema within 1500 microns of the foveal center and documented to be progressing toward the foveal center). Treatment consists of focal/grid photocoagulation; focal (direct) laser treatment to microaneurysms within thickened retina and grid (macular scatter) laser within other areas of thickened retina. The Early Treatment Diabetic Retinopathy Study (ETDRS) demonstrated that such treatment can reduce the risk of at least moderate vision loss from 30% without treatment to 15% with treatment when the center of the retina is edematous or threatened to become edematous.⁵ Most of the cases enrolled in the ETDRS, though, had visual acuity better than a Snellen equivalent of 20/40. The Diabetic Retinopathy Clinical Research Network (DRCR.net) subsequently demonstrated that focal/grid laser was superior to intravitreal corticosteroid

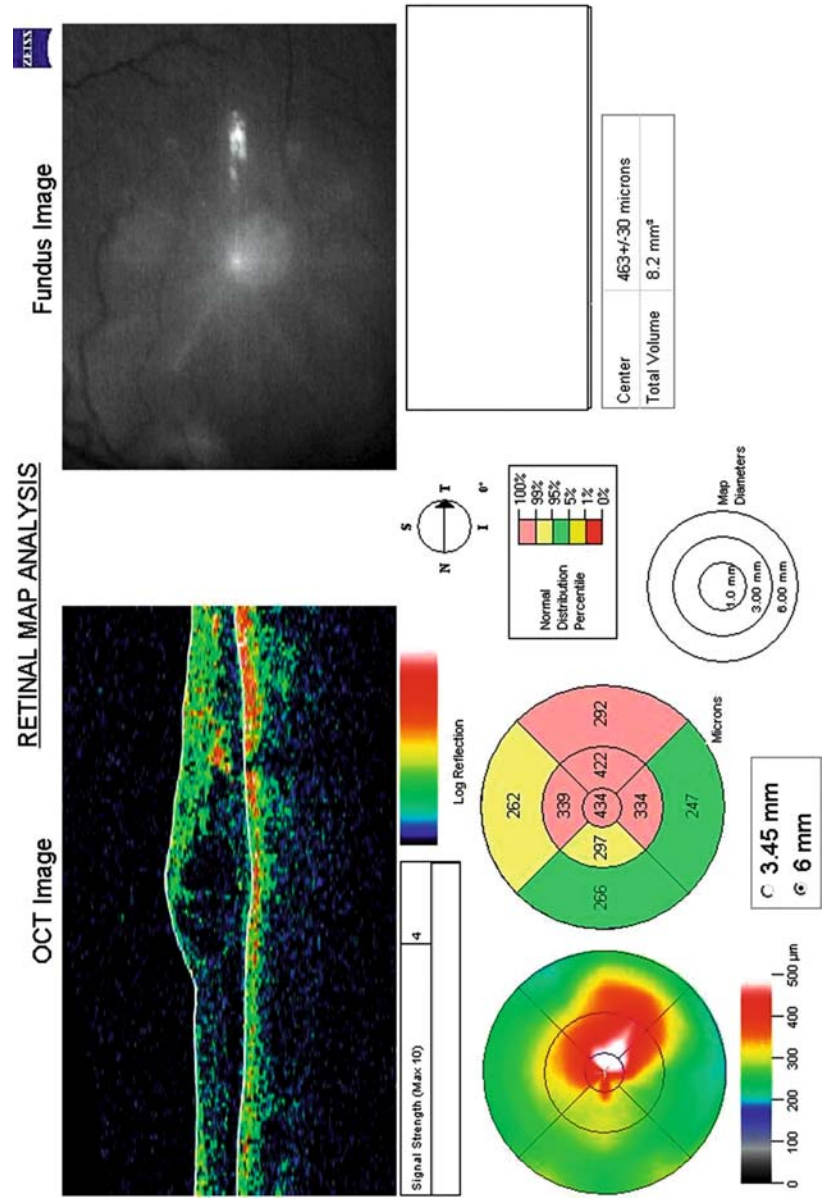


Fig. 2 Corresponding OCT of fundus photograph in Fig. 1 showing thickening of the central subfield.
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Fig. 3 Corresponding fluorescein angiogram of the fundus photograph in Fig. 1 demonstrating microaneurysms for which direct (focal) treatment would be applied; additional grid treatment would be applied to additional areas of macular thickening not corresponding to microaneurysms.

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injections at not only reducing the risk of substantial vision loss (approximately two or more lines) to about one out of five cases, but also increasing the chance of substantial vision gain (approximately two or more lines) to about one out of three.⁶ Since the results of the DRCR.net study suggested that intravitreal corticosteroids likely led to superior outcomes compared with no treatment, studies are underway to determine if combining laser with intravitreal corticosteroids leads to superior outcomes compared with laser alone. Furthermore, preliminary data also show improvement in vision following treatment of diabetic macular edema with antivascular endothelial growth factor drugs, such as ranibizumab⁷; thus, studies are underway to determine if these drugs alone, or in combination with focal/grid laser are superior to focal/grid laser alone or superior to focal/grid laser plus corticosteroids.

Management of the Level of Diabetic Retinopathy

Regardless of whether macular edema is present, the ophthalmologist also must determine the level of retinopathy, which could range from no diabetic retinopathy, to mild nonproliferative diabetic retinopathy, to moderate to severe nonproliferative diabetic retinopathy, and to proliferative diabetic retinopathy. If severe nonproliferative diabetic retinopathy is noted (either of the following: (1) 4 or 5 fields of severe microaneurysms (Fig. 4, Standard 2A), (2) at least 2 fields of definite venous beading (Fig. 5, Standard 6A), or (3) at least 1 field of moderate

Fig. 4 Diabetic retinopathy study standard photo 2a.
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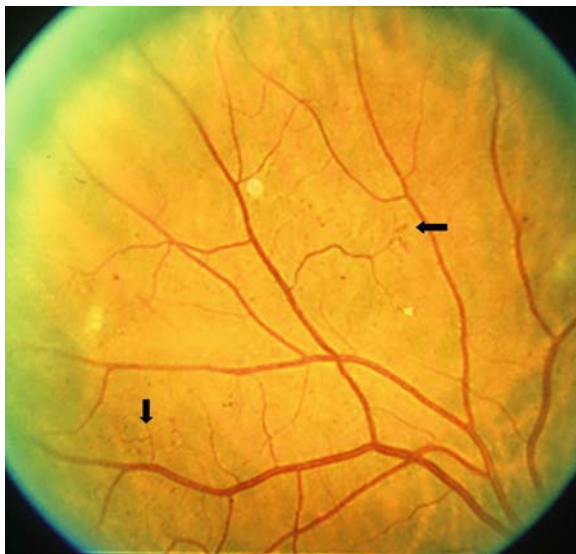


Fig. 5 Diabetic retinopathy study standard photo 6a.
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intraretinal microvascular abnormalities [IRMA]) (Fig. 6, Standard 8A), then careful follow-up is warranted because of a relatively high risk of progressing to proliferative diabetic retinopathy (PDR). Less than severe nonproliferative diabetic retinopathy also requires careful follow-up from once a year, to twice a year, to three times a year, depending on the history, findings, and status of

Fig. 6 Diabetic retinopathy study standard photo 8a. Source: Reprinted with permission from the Department of Ophthalmology and Visual Sciences, University of Wisconsin – Madison



diabetic macular edema.⁸ Neither a fluorescein angiogram nor OCT is needed to manage the level of retinopathy, although 7-field fundus photographs can be helpful to confirm the level of retinopathy and for comparison to future visits.

If an eye has high-risk PDR (3 or 4 high-risk factors, including (1) evidence of new vessels, (2) evidence of new vessels on the optic disc (NVD), (3) severity of new vessels [either NVD greater than about a third of the area of the optic nerve or new vessels elsewhere, NVE, greater than about a half disc area], and (4) preretinal or vitreous hemorrhage), or as an eye approaches high-risk PDR, then panretinal photocoagulation (PRP) should be applied to reduce the risk of severe visual acuity loss (2 or more visits, separated by 4 months apart, of 5/200 visual acuity or worse). Side effects of PRP can include reduction of night vision, which already might be compromised in the older patient.

If vitreous hemorrhage occurs, either prior to placement of PRP, or after, vitrectomy might be indicated if macular detachment from fibrous proliferans is evident or appears imminent (using ultrasonography if the hemorrhage precludes evaluation of the macula). Vitrectomy also might be indicated if vitreous hemorrhage does not clear promptly, although the risk of observation over early vitrectomy might be less for older individuals than younger patients.⁹

Case Resolution

Our patient underwent 7-field fundus photographs of each eye, which documented moderate nonproliferative diabetic retinopathy, warranting follow-up at least every 6 months to monitor for the possibility of either eye approaching

high-risk PDR for which PRP would be indicated. In addition, OCT was obtained to document the extent of central subfield thickening in each eye. With confirmation of diabetic macular edema involving the center of the macula in each eye, a fluorescein angiogram was obtained to facilitate the placement of focal/grid photocoagulation. The patient was asked if his family wanted to join him for a discussion of the management of his condition since so much information needed to be relayed. Furthermore, it was offered to send this information to his primary care provider or provider of his diabetes care or both, with a copy to the patient to share with any of his other health care providers, since the management might be relevant to a large number of providers in a patient with diabetes.

He was told that focal/grid photocoagulation could reduce his risk of substantial vision loss compared with no treatment, but that there still was a one in five chance of losing substantial vision with laser treatment. Furthermore, he was told that most treated patients do not have substantial improvement in vision, although the treatment would not reduce his chance of improving, and that about one in three treated patients have substantial improvement. Following treatment of one eye, the other eye would be treated if the patient still agreed with this plan after experiencing the treatment in the first eye (since the patient's perception of the risks and benefits of treatment might differ after actually experiencing laser treatment in one eye).

Once the management of the diabetic macular edema was discussed, attention is given to the management of the level of retinopathy. Because of the volume of information, this discussion, which is not urgent, might be reserved for an upcoming follow-up in conjunction with subsequent visits for managing the diabetic macular edema in each eye. He should be aware of the need to monitor each eye for progression to PDR, and as the eye develops or approaches high-risk PDR, a different type of laser treatment, PRP, would be indicated to reduce the chance of severe vision loss. He should be reminded that development of PDR usually first develops in the absence of visual symptoms, so that the patient should not wait for visual symptoms before returning for follow-up.

He should also be advised that loss of vision from capillary nonperfusion, especially within the macula, cannot be treated once it develops and that control of diabetes is important to reduce the chance of vision loss from progression of capillary nonperfusion.

Finally, he should be aware that intensive management of diabetic macular edema and level of diabetic retinopathy does not remove his need to continue his comprehensive eye care. The challenge in the care of the older patient with diabetic retinopathy is to add this management to his comprehensive eye care and his extensive comprehensive medical care as a result of his diabetes and the comorbidities associated with aging.

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Age-Related Macular Degeneration and Its Management

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Case Vignette

A 75-year-old woman notes increasing difficulty with reading and walking down steps in dim light over the past 6 months. During her last comprehensive eye examination 1 year ago, she recalls that she had been diagnosed with early cataracts and also was told she had the beginning signs of macular degeneration. While she was somewhat anxious with this latter diagnosis, her doctor told her to consider taking a dietary supplement. She bought a multivitamin with lutein over the counter as she heard from a friend that people with macular degeneration should take this supplement. She believed that her progressive difficulty with vision was either because her glasses needed changing or her cataracts were worsening, or she was just losing vision with age.

On evaluation, her visual acuity was 20/25 in the right eye and 20/50 in the left eye with her glasses. A refraction revealed no change to her current prescription and did not result in any better visual acuity measurement. Her pupils reacted normally, and her intraocular pressures were 15 and 17 mmHg in the right and left eyes, respectively. The slit-lamp examination showed mild nuclear opacity, which did not appear to account for any decrease in visual acuity. Dilated ophthalmoscopic examination of her right eye showed numerous large drusen, in which many of the drusen were larger than 125 microns (greater in size than a retinal vein width as it crosses the optic nerve). Dilated ophthalmoscopic examination of the left eye also showed large drusen; in addition, there was thickening of the central retina with loss of the normal foveal depression and a small amount of subretinal hemorrhage at the temporal margin of the thickened area.

Adapted in part from Clinical Advances in Age-Related Macular Degeneration, Johns Hopkins University School of Medicine Continuing Medical Education Enduring Material, 2007–2008.

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Patient Care

This vignette provides a good example in older people of the challenges of managing age-related macular degeneration, the most common cause of vision loss in people over age 50 in the United States if left untreated.¹ The patient's complaints, while nonspecific, indicate difficulties with near (reading) and distance (going down stairs in dim light) activities. The patient's recall of a diagnosis of both cataract and macular degeneration demonstrates not only good communication between the patient and her comprehensive ophthalmologist, but also the challenges of multiple diagnoses in older people. Since some degree of cataract can be ubiquitous, almost any patient over the age of 70 might recall such a diagnosis. A potential danger is that such patients subsequently may ascribe any vision loss to the incorrect perception that the vision loss is from progression of cataract. In this case, the patient believed that recent vision loss "must" be, at least in part, from the cataract. We learn from the physical examination that her cataracts can be seen with a slit-lamp biomicroscope but are not visually significant and not the cause of her recent vision loss. Furthermore, the patient believes that vision loss is an inevitable symptom of aging rather than ascribing a specific diagnosis to her visual impairment. While vision loss may become more common with age, older patients should realize that aging, in and of itself, is not a cause of vision loss. Rather, specific diagnoses that become more prevalent with older age are reasons for vision loss. Older patients should not just accept vision loss as an inevitable sign of aging but should pursue with an ophthalmologist what the cause of vision loss is, especially since most incidents of vision loss in older people can be treated.

The case also demonstrates the anxiety that can come with a diagnosis of age-related macular degeneration (AMD). Until a few years ago, most people who developed the neovascular or "wet" form of AMD lost substantial vision, first in one eye, and then often in the other eye within a few years, resulting in tremendous loss of function. Because there are approximately 200,000 new cases of neovascular AMD in the United States each year,² it is common for many older patients to know someone or many people who have lost much of their independence and daily functioning from vision loss due to AMD. Thus, it is important for health care professionals who interact with older people to understand that the risk of vision loss from the neovascular form of AMD can be greatly reduced with the use of certain intravitreal anti-VEGF drugs based on randomized clinical trials evaluating ranibizumab,^{3,4} so that this information can be relayed appropriately to the older population.

The patient was also taking a dietary supplement formulation (a multivitamin with lutein) that had not been tested in randomized clinical trials to show any efficacy. This situation is also not uncommon but is important for anyone caring for older people to understand. Specifically, the Age-Related Eye Disease Study (AREDS) showed that a specific dietary supplement formulation might reduce the risk of progression to the advanced stage of AMD (usually neovascular

AMD) in people with the intermediate stage (usually large drusen).⁵ However, because this formulation is not a prescription, and because sales of numerous dietary supplement formulations are available over the counter, often with ingredients added based on epidemiologic associations, older people often will take such formulations with little evidence to support their use. Typically, these epidemiologic associations have potential bias or confounding to lead to an erroneous assumption that taking a supplement based on these associations is proof of benefit. Instead, the older person should understand that the supplement is hypothesized, from epidemiologic studies, potentially to be beneficial but requires confirmation in subsequent, usually randomized, controlled trials before one should assume that there is strong evidence to support such an intervention. These challenges have been evident in studies evaluating older people's understanding of dietary supplements in AMD.⁶

Management of AMD in Older People

Management of Intermediate and Often Large Drusen

Clinical signs of the intermediate stage of AMD include large drusen (≥ 125 microns, the approximate width of a retinal vein as it crosses the optic nerve) and abnormalities of the retinal pigment epithelium, including focal hyperpigmentation or depigmentation as well as geographic atrophy of the RPE that does not involve the center of the macula.⁵ Approximately 8 million Americans have at least one large drusen.² Thus, the intermediate stage of AMD is very common; of the 60 million people in the United States over the age of 55, at least 1 in 8 has the intermediate stage; over the age of 75, the number is closer to 1 in 4.

Given that smoking is such a well-recognized risk factor for AMD,⁷ and given that smoking is a risk factor for so many other medical problems in older people, including lung cancer and cardiovascular disease, there is no reason not to use the identification of AMD as yet an additional reason for cigarette smokers to stop smoking.

The initial work-up for a patient suspected of having AMD should consist of a detailed history including any new onset metamorphopsia (visual defect in which objects appear wavy or distorted) or central scotoma, ocular history, and use of dietary supplements. As mentioned earlier, with so many supplements available over the counter, it is useful to look at the actual label accompanying the supplements to determine if the content is similar to that used in AREDS.

The ophthalmological examination, as described in the AAO's Preferred Practice Pattern for AMD, should include an evaluation of visual acuity along with stereoscopic biomicroscopic examination of the macula and, if choroidal neovascularization (CNV) is suspected, fluorescein angiography (Fig. 1). If CNV is confirmed on angiography, the location of the lesion, with respect to the center of the foveal avascular zone, and the lesion composition



Fig. 1 Evaluation of the macula.

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should be determined to aid in the decision regarding the management of the CNV (see next section on neovascular AMD).

The intermediate stage of AMD is defined as the presence of one or more of the following three components: at least one large drusen (about one retinal vein width as it crosses the optic nerve or $125\ \mu\text{m}$), a large area of medium size ($64\text{--}125\ \mu\text{m}$) drusen, or geographic atrophy of the retinal pigment epithelium and overlying photoreceptors sparing the macular center.⁵ In a simplified severity score from AREDS,⁸ the presence of large drusen and pigment abnormalities in the retina (increased or decreased spots of pigmentation) are evaluated for each eye separately. The theoretical maximum severity score is 4 if both factors are present in both eyes. For clinical purposes, based on this scale, patients with 0, 1, 2, 3, or 4 risk factor(s) would have a 0.5%, 3%, 12%, 25%, and 50% chance, respectively, of progression to advanced AMD (usually the neovascular form of AMD) within 5 years. About 30% of the progression could be to geographic atrophy of the retinal pigment epithelium, which, if it progresses over years into the center of the macula, also can be associated with severe visual acuity loss for which there is no treatment at this time except to pursue low-vision aids to assist with visual tasks.

Ideally, interventions for the intermediate stage of AMD should aim to preserve central vision for as long as possible, so the patient can continue to read and perform activities of daily living. Therapeutic interventions should also have minimal adverse effects. The American Academy of Ophthalmology (AAO) recommends monitoring patients with no AMD or no intermediate stage of AMD to identify evidence of progression to the intermediate stage.⁹ Ophthalmologists should provide a comprehensive medical eye evaluation every 1–2 years for those patients 65 and older. Based on results from AREDS, the AAO does not recommend the use of AREDS supplements in clinical practice for patients with no AMD or without the intermediate stage of AMD.

For patients with the intermediate stage of AMD, ophthalmologists should educate them to monitor themselves for onset of symptoms suspicious for CNV (new onset of marked metamorphopsia or sudden new scotoma). Ophthalmologists should emphasize to patients that if they have drusen only, they likely will be able to preserve vision for a long time. Patients should be instructed to see an ophthalmologist promptly to confirm signs of disease progression.

For subjects with the intermediate stage of AMD in one or both eyes, or the advanced stage of AMD in one eye in which the second eye is at risk of progressing to advanced AMD, the 5-year risk of progression to advanced AMD was 28%.⁵ In contrast, similar subjects who took a combination of dietary supplements with antioxidant vitamins and zinc for 5 years (including 500 mg of vitamin C, 400 IU of vitamin E, and 15 mg of beta carotene coupled with 80 mg daily of zinc as zinc oxide as well as 2 mg of cupric oxide to reduce the risk of copper-deficiency anemia) experienced a substantial reduction in the development of advanced AMD vs placebo.

Based on these data, the AAO recommends that patients with the intermediate stage of AMD consider taking antioxidant and zinc supplements at the dosages used in AREDS. As mentioned earlier, health care providers should ensure that the patient actually is taking the dietary formulation described in AREDS, including looking at the actual supplements bought over the counter, if necessary, to confirm the correct tablets have been obtained.

Patients at highest risk for progression to advanced AMD may also ask their ophthalmologists about the use of supplements other than those used in AREDS. The evidence base supporting use of antioxidant supplements such as lutein or zeaxanthin or omega-3 fatty acids are based on associations, not cause and effect. Even weaker evidence supports consideration of herbs such as *Ginkgo biloba*.

Patients with the intermediate stage of AMD must be carefully monitored to ensure understanding of progression of existing disease and in conjunction with other potential causes of visual acuity loss often seen in older people such as cataract.

Health care providers should also be aware of potential safety issues that may develop in patients taking supplements such as those used in AREDS. Beta-carotene may increase the change that a person reports their skin turning yellow, and may increase risk of developing lung cancer in cigarette smokers. Zinc may increase the risk of genitor-urinary hospitalizations, especially in men. Vitamin E usage may need to be coordinated with a primary care provider when older people often may be on medications which can affect the coagulation pathway, such as coumadin.

Management of the Neovascular Stage

When CNV is suspected or detected on examination, such as thickening of the macula, subretinal hemorrhage, or lipid, or pigment epithelial detachment in an older person with drusen, fluorescein angiography is needed to confirm the diagnosis and determine management. The angiogram is used to establish the

entire extent of the lesion, so that location with respect to the center of the macula can be determined, and to determine the lesion composition on angiography. It also may be used to evaluate response to treatment. Optical coherence tomography (OCT) also may have a role in monitoring for the development of CNV as well as to evaluate response to treatment; studies are ongoing to determine this.

Rarely if a lesion is well-demarcated, symptomatic, and not involving the center of the macula, laser photocoagulation can be used to confine the lesion from extending into the center. Such an outcome might occur about 50% of the time in these unusual cases. If these cases recur under the center, or more commonly, when the case presents with CNV under the center of the retina, the composition of the lesion is evaluated on fluorescein angiography to determine if treatment is indicated. If a majority of the lesion has angiographic features of CNV rather than of scar or blood, i.e., the lesion is predominantly CNV, then treatment might be considered. If the majority of the lesion is blood or scar, it is unknown if treatments discussed below are applicable; the closer the lesion is to being predominantly CNV, the more likely one might consider anti-VEGF treatment as has been shown to be beneficial in randomized clinical trials of ranibizumab.

For lesions which are predominantly CNV, and the fluorescein pattern also demonstrates that at least 50% of the lesion has features of classic CNV, the Anti-VEGF Antibody for the Treatment of Predominantly Classic Choroidal Neovascularization in Age-Related Macular Degeneration (ANCHOR) phase III trial⁴ showed at 1 year (the primary endpoint) that 94% of participants who received ranibizumab 0.5 mg avoided substantial vision loss, i.e., 15 or more letters of visual acuity loss (approximately 3 or more lines on a standard eye chart, representing a doubling of the size of the letters), compared with 64% of subjects receiving photodynamic therapy with verteporfin. For lesions which are predominantly CNV, but the fluorescein pattern shows that less than 50% of the lesion has features of classic CNV, treatment has been shown to be beneficial only for cases with recent disease progression (blood, or recent visual acuity loss, or recent growth of the lesion on fluorescein angiography), since many of these cases without recent disease progression can remain stable for years. For such cases with recent disease progression, at the 1-year primary endpoint, 95% of subjects who received ranibizumab 0.5 mg avoided substantial visual acuity loss compared with 62% who were observed.³ Only approximately 1/3 of treated patients have substantial vision gain, making it important to identify and treat these cases before substantial vision loss has occurred. Common adverse ocular events include subconjunctival hemorrhage and eye pain (presumably from topical antiseptic used to reduce the chance of an intraocular infection) as well as transient vitreous floaters, presumably from the medication itself or tiny air bubbles injected with the medication. Uveitis and endophthalmitis occurred in fewer than 1% of subjects.

Serious nonocular adverse events which have been reported with intravenous use of anti-VEGF drugs, such as bevacizumab, are cerebrovascular accidents or myocardial infarction, occurring more rarely in the anti-VEGF arms compared with control arms.

These outcomes were reported with monthly intravitreal ranibizumab injections over 2 years. It is unknown if a less frequent schedule is noninferior to (almost as good as) monthly injections, but treating these cases is a challenge for the older population because whether the patient is treated monthly, or as often as monthly when judged indicated, frequent follow-up is needed either for the monthly treatments or to determine if additional treatment is needed.

After the results of randomized clinical trials with ranibizumab were known, but prior to its availability and approval by the FDA, ophthalmologists used bevacizumab in the hope that a similar anti-VEGF drug would provide results which were noninferior to (almost as good as) ranibizumab. When 0.05 mL of the currently packaged bevacizumab (for intravenous use) is compounded to create multiple doses for injection into the vitreous, for example 1.25 mg in 0.5 mL, its usage is off label as the currently available bevacizumab was not labeled for multidose use or compounding in this way and was not labeled for intravitreal use or for treatment of neovascular AMD or other retina diseases. However, the cost to the physician subsequently to be charged to the patient for each application, likely under \$100 (compared with approximately \$2000 for each application of ranibizumab)¹⁰ coupled with the potential benefits documented in smaller case series than randomized trials with ranibizumab, makes the off-label use of bevacizumab a potential treatment option, especially when ranibizumab is not available because of regulatory or cost issues to the patient or the treating ophthalmologist. These facts can be difficult concepts for the older patient to understand, so that adequate time is needed to explain not only the diagnosis of neovascular AMD, and the risks and benefits of monthly ranibizumab from large-randomized clinical trials, but also the impact of a reduced frequency dosage schedule and the economic factors involved with using bevacizumab vs ranibizumab.

Impact on Patient's Perception of Quality of Life Because of Vision

Health care providers working with older people should be aware of the implications of AMD and its treatment on both the mental health function and the physical well-being of elderly patients. Recent studies¹¹ have shown that ranibizumab treatment of CNV can have a profound effect on patient function such as distance activities (such as watching television or driving), near activities (such as reading or sewing), depending on others because of vision, or mental health because of vision.

Case Resolution

Our patient underwent fluorescein angiography and was found to have choroidal neovascularization extending under the center of the macula in the left eye in which the lesion composition was judged to be minimally classic (the area of classic CNV was less than 50% of the area of the entire lesion on angiography)

in association with subretinal blood, presumably representing recent disease progression. The patient was asked if her family wanted to join her for a discussion of the management of her condition since so much information needed to be relayed. Furthermore, it was offered to send this information to her primary care provider with a copy to her to share with any of her other health care providers, since the management might be relevant to a large number of her providers. She was told that ranibizumab treatment likely would not lead to substantial improvement for the left eye, since only about 1/3 of treated cases might be expected to have such improvement, but that substantial improvement without treatment was quite rare. Furthermore, she was told that it was unlikely that she would have substantial vision loss, but there still was about a 10% chance that such loss could occur, an important fact to share in case she was under the assumption that the treatment led to good outcomes in everyone. Nevertheless, it was emphasized that without treatment it was common to lose substantial amounts of vision. She was reassured that the major risks of vision loss that she heard could happen from AMD previously likely do not apply to her because of benefits seen with ranibizumab either for her left eye, or if needed in the future, for her right eye. Also, she was told that commonly she might experience a subconjunctival hemorrhage after an intravitreal injection, even though the needle is about the size of a hair and can be injected in the office with topical anesthesia. Furthermore, she might have some irritation from topical antiseptic, but that with meticulous attention to antisepsis, endophthalmitis was extremely unlikely, although not zero in its risk. She was also told that multiple visits for at least the next two years would be needed, as often as monthly, to provide treatment or determine if additional treatment is needed, so that coordination with family or friends or other transportation arrangements would be needed. Finally, she was told that if she had Medicare and an insurance to cover her copayment, whether she was treated with ranibizumab or bevacizumab, the cost to her would be the same, although the cost to insurance and society and perhaps even her ophthalmologist managing large funds for ranibizumab would be different for ranibizumab than bevacizumab.

Once the management of her left eye is complete, attention is given to the management of her right eye. Because of the volume of information, this discussion, which is not urgent, might be reserved for an upcoming follow-up in conjunction with subsequent visits for repeated intravitreal injections of the left eye. She should be aware that the intermediate stage in her right eye puts her at risk of progressing to the advanced stage, and she should monitor for this progression by checking her right eye, by itself (covering the left eye) at least weekly to look for a change in the central vision such as a scotoma or metamorphopsia. Such symptoms should result in her contacting the office which should be aware of the need for prompt evaluation to determine if these symptoms are from the development of the neovascular form. Furthermore, even if she does not note these symptoms, she should have periodic monitoring by her ophthalmologist to identify the onset of

asymptomatic neovascular AMD, so that treatment, if indicated, could be initiated before substantial vision loss has occurred.

She should be advised that a government-sponsored study determined that taking a certain formulation of vitamins and minerals might reduce her risk of progressing to the advanced stage of AMD in her right eye by a small amount. However, she should provide this information to her primary care provider to be certain there are no problems with her taking these high doses of vitamins and minerals, and if she does start to take these supplements, she should bring a box of what she purchased with her so her ophthalmologist can confirm that the over-the-counter supplement is indeed the formulation used in AREDS.

Finally, she should be aware that this intensive management of this one diagnosis does not remove her need to continue her comprehensive eye care. The challenge is to add this AMD management to her comprehensive eye care and her comprehensive medical care.

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Low Vision: When Vision Fails

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Case Report

An 80-year-old woman and her sister who is 85 years old visited their ophthalmologist both complaining of a loss of vision for the past few months. Previously the younger sister was able to drive, prepare meals, read prescription labels, and pay the bills. Lately she has had difficulty with all of these tasks. Both sisters had undergone successful cataract surgery a few years earlier. The younger sister had assumed many of the homecare responsibilities as she felt her older sister not only could not see as well but had some early cognitive impairment. The ophthalmologist uncovered bilateral macular degeneration in both the sisters. The older sister was content with her life situation and was happy with talking books and a reading radio service. She had depended on her younger sister for so long she assumed things would remain the same. As she did not drive and meals were prepared she noticed little loss in her daily activities. The younger sister did find managing the home more difficult and was hoping a new pair of spectacles would cure her visual concerns.

Practice-Based Learning and Improvement

With the aging of our population has come an increased incidence of older adults with vision loss. When this vision loss is not corrected with standard spectacles and medical or surgical treatment the patient's vision loss and loss of visual function is referred to as low vision (Fig. 1). Eye doctors need to address the care and treatment of these patients to enable those with vision loss to remain independent and productive. Identifying their loss and providing treatment options are essential to maintaining productivity and independence. The cost of caring for those with blindness and vision impairment is rising yearly. The impact on the patients and their families is not only economic but social as

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Fig. 1 Low-vision aids facilitate the pursuit of the activities of daily living. Source: Reprinted with permission from the Department of Ophthalmology, The University of Iowa Carver College of Medicine



well with a significant increase in the depression associated with vision loss.¹ It has been estimated that the number of blind people in the United States over age 40 years would increase to 1.6 million by the year 2020, and the number of person with low vision is projected to be 3.9 million by 2020.² The incidence of low vision and blindness in community-dwelling adults increases dramatically in all racial and ethnic groups.³ The cost annually of adult vision problems approaches \$51.4 billion.⁴

These sisters had depended on each other for many years both emotionally, socially, and financially. They had pooled their retirement resources to secure safe housing. Until now this was true but now they needed outside assistance. The younger sister could no longer drive safely or perform visually as she had previously. Their ophthalmologist referred to information he had received from American Academy of Ophthalmology, Smartsight, Making the Most of Remaining Vision,⁵ and elected to give them information on resources available in their community.

Medical Knowledge

The ophthalmologist performed a complete eye examination on both sisters and determined that they would not be candidates for laser treatment or intraocular medication. It was felt that both sisters should continue taking multivitamins and be given the best-obtained refraction with a higher reading add to enable them to see the large print with greater ease. The ophthalmologist was aware that almost a quarter of patients with impaired vision have trouble managing their household duties. In a study by Brody et al., approximately a third of patients with advanced macular degeneration demonstrated a depressive disorder.⁶ With this in mind he wanted to maximize their usable vision and referred them to a local Vision Rehabilitation Center for evaluation and low-vision treatment.

Patient Care

The sisters visited the low-vision center together. They had the opportunity to speak with a social worker who was able to assess their living situation and provide them with a referral to an eldercare agency. The agency was able to provide services which provided them with transportation to go shopping and to medical appointments. They also provided aides to help them maintain their home by helping with cooking and cleaning. Alternative living scenarios were suggested and visits to assisted living homes were arranged. A social worker was assigned to help evaluate the sister's success in performing IDLS (instrumental activities of daily living skills) such as meal preparation, using the telephone, housekeeping, handling finances, as well as taking medications safely.

Interpersonal and Communication Skills

The ophthalmologist discussed his findings with the primary care provider. His concerns were relayed to the medical doctor who was caring for the sisters. They agreed to encourage the sisters to look into available services and possibly assisted living. There were no other family members living near the sisters to look in on them and provide support. Both the ophthalmologist and the internist had known the sisters a long time and their relationship with them was such that they were receptive to the doctors' suggestions. Taking the extra time from a busy practice to make sure the proper referrals are made could be the difference between a poor outcome and a good quality of life.

Professionalism

Their ophthalmologist went the additional step. After providing initial low-vision care on site by improving and maximizing their vision with a stronger reading add and updated refraction, he referred them to a Low Vision Center. They also were referred to an elder care agency, which helped them navigate the often complex system. Communication and linkages between providers was initiated.

Systems-Based Practice

A study published in 2007 showed that non eye-related costs were found to be from \$2193 to \$4443 higher for moderate, severe, and blind categories. Any degree of progressive vision loss was associated with increased odds of

depression, injury, skilled nursing facilities utilization and long-term care admission.⁷ By providing the sisters with appropriate intervention, their risk of depression and injury and perhaps long-term care admission could be reduced. Taking all of this account should play a role in each provider's care of his/her patients. In this way the patients receive the best care in the most efficient, cost-effective way with attention to the whole person.

Case Resolution

The sisters each received a comprehensive low-vision evaluation. The older sister enjoyed some of her nonoptical low-vision aids such as a talking watch and talking clock. She also utilized large print playing cards. A magnifier she could wear around her neck allowed her to read phone numbers left for her by her sister. Talking books were provided as well. The younger sister made use of several magnifiers to help her read labels on medication bottles, directions on food packages as well as mail and bills. A Closed Circuit TV (CCTV) was demonstrated and she will consider this if and when her vision deteriorates (Fig. 2). A rehabilitation teacher for the visually impaired spent a few hours with the sisters in their home and marked the microwave, oven, washer, and dryer with marks that were raised and bright so that they could see and feel the dials to utilize them properly. The rehabilitation teacher also looked around the home for other ways she could simplify their vision concerns and make the home safe. Additional services were offered and a list of groups for older adults with vision impairments was presented for support. The vision-rehabilitation process was explained as an ongoing relationship was established.

Fig. 2 Low vision aids being demonstrated (in this instance a closed circuit television). Source: Reprinted with permission from the Department of Ophthalmology, The University of Iowa Carver College of Medicine



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Visual Loss and Depression

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Case Vignette

A 95-year-old woman is brought in by her family for poor vision. She only provides “yes” or “no” answers to questions and seems to have a blunted affect. Her family members report that she has been complaining about her vision being poor “for years” and that the three other ophthalmologists she saw previously had told them she was “just getting older.” She had undergone uncomplicated cataract extraction with intraocular lens placement bilaterally ten years prior. Her previous visual acuity had been 20/25 OU with correction. Over the last few years, however, she had moderate geographic atrophy of the retinal pigment epithelium centrally and her vision was now 20/70 OU, but her glasses had not been changed in years. She complained that she was no longer able to read and do her crossword puzzles. The family reported that she seemed more withdrawn recently and was not eating very well. They were concerned that perhaps it was because she could not see her food. She was on no medications and lived in a retirement home.

Introduction

Visual loss can be a devastating comorbidity with clinical depression. The loss of vision and the secondary effects on ambulation, mobility, and activities of daily living can produce pathologic grief reaction, increased anxiety, and depressed mood. The acute and chronic psychosocial consequences of visual loss can predispose, worsen, or even precipitate clinical depression in the elderly patient. The role of the ophthalmologist is to recognize, triage, and refer patients with visual loss who exhibit signs or symptoms of depression (Fig. 1). The ophthalmologist should be aware that visual loss is a risk factor for treatable depression.

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Fig. 1 The goal of the clinician is to provide the patient with the best quality of life, optimizing the potential activities of daily living for each elderly patient including identifying risk factors such as depression.

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Practice-Based Learning

Depression, like other comorbidities with visual loss, can be a disabling but often underrecognized disorder in the elderly. The ophthalmologist should be aware that visual loss can worsen depression in the elderly. Appolonio et al. reported that uncorrected visual loss was associated with a significant and independent impairment of mood, self-sufficiency in instrumental activities of daily living, and social relationships.¹ The impact of depression in older patients with visual loss extends beyond the two disorders alone and can affect quality of life and mortality. The nonadjusted 6-year mortality rate for men with uncorrected sensory impairment was almost twice that of the control groups possibly due to indirect effects on “global physical health status” and perhaps other “social relationships.” Rovner et al. reported a correlation of disability between depression and loss of vision ($p = 0.013$).²

Depression and symptoms of depression are common in the low-vision population and are more highly related to disability than the vision loss per se. Rovner and Ganguli reported on 872 noninstitutionalized elderly persons aged over 68 years,³ and in this study impaired vision and depression were both associated with functional impairment. Depression increased the odds of functional impairment independent of the vision impairment. Thus, there is a rationale for early recognition and treatment of the depression component of visual loss. The treatment includes not only medical and surgical therapies for recognized ophthalmic disorders but also low-vision rehabilitation.

Carbellese in a study of 1191 noninstitutionalized elders (age 70–75 years) reported that single sensory impairments (i.e., visual or auditory) were significantly and independently associated with increased risk for depression (odds ratio: 2.3).⁴ Visual impairment in other studies has also been shown to be an independent risk factor for impaired social relationships. The ophthalmologist should be aware that depression and visual impairment are known comorbidities. In addition, visual symptoms may be the presenting or only manifestation of underlying depression in the elderly.

Screening patients for depression might be useful for patients with visual loss.^{5,6} Galaria et al. reported a shorter version of the Geriatric Depression Scale (GDS) for screening visually impaired older patients.⁶ The ophthalmologist might be able to help patients with depression and visual loss by identifying patients at risk, treating and providing rehabilitation for patients with low vision, and referring patients with depression for treatment. Horowitz et al. reported the effects of vision rehabilitation using low-vision clinical services, skills training, counseling, optical device use, and adaptive devices on depression in 95 older adults with age-related vision impairments. These interventions improved the depression in these patients as well as physical and psychological functioning.⁷ Brody et al. reported the effectiveness of a self-management program of health education and enhancement of problem-solving skills on patient mood and function in 231 patients with age-related macular degeneration. The self-management group showed significant improvement in measures of mood and function versus controls.⁸

Communication Skills

A patient who is clinically depressed may not ask for help. Elderly patients with depression may present with visual loss as their chief complaint and may manifest symptoms that might be mistaken for “old age” or “dementia.” Patients with new visual loss could be screened for depression with simple and easy-to-administer questions. Patients with evidence for depression on the screening test should be referred for further evaluation and treatment. Lee et al. screened 50 consecutive ophthalmology clinic outpatients for depression using a single question for depression (i.e., “Do you often feel sad or depressed?”). Of the 50 patients, 20% were positive for the depression screen. The test takes only 30 seconds to administer and might be useful for patients who are at high risk. The ophthalmologist worried about depression in the elderly patient should ask the patient and family if the patient is depressed and should offer the patient the opportunity for further evaluation and treatment for depression as needed.

Systems-Based Learning

Kohn and Epstein-Lubow reported that depression in the elderly is often underrecognized and undertreated. Patients with low vision may be at particular risk.¹³ Ophthalmologists can help patients with visual loss to reduce the

functional impact of the comorbidity of depression in these patients through early recognition and appropriate referral for treatment. In addition, depression can produce somatic symptoms including decrements in vision that cannot be accounted for by the severity of their underlying ocular disease and may be related in part to the patient's own adaptive strategies and self-perception of visual loss.^{11,12} The role of the ophthalmologist is to recognize and refer patients who might have depression as the root cause of their complaints and not necessarily to initiate treatment. Coordinating the evaluation and management of any concomitant depression in the older patient requires an understanding of the system of care for an individual patient and accessing the necessary caregivers to insure appropriate follow-up and treatment as necessary.

Professionalism

Ageism is a pervasive and destructive process. A patient's chronological age is not as important as their functional abilities and health. Elderly patients should not be denied care simply because they are older. Sensitivity to the older patient's specific needs and desires is an important part of the evaluation and management of this patient in order to maintain the patient's dignity, respect her autonomy, and allow participation in her own care and decision making.

Patient Care Summary

In this 95-year-old woman, although her main complaint is poor vision and she was brought in by her family, there are clearly other issues involved other than her visual problems. Because she can only provide "yes" or "no" answers to questions and has a blunted affect, it would be tempting to simply address the questions and instructions for care to the family but this should be avoided if possible. Part of the communication competency is dispelling any misinformation or miscommunication from the prior providers and perhaps providing reassurance to both the patient and to her family members. She may have been complaining about her poor vision "for years" but this does not diminish the significance of the complaint or the possibility that it is due to treatable pathology. In addition, although the three prior ophthalmologists she saw previously had told them she was "just getting older," many of the major blinding disorders in the United States increase with increasing age (e.g., diabetic retinopathy, glaucoma, and age-related macular degeneration). Ageism in the evaluation and diagnosis of older patients is just as pervasive and destructive as discrimination on the basis of age for availability of treatments.

Assessment of the affect and mood in this patient is helpful in determining that depression might be an issue compounded by her visual loss and the loss of function and activities of daily living. Upon further questioning, she reported that not being able to read and do her crossword puzzles was a significantly negative impact of her visual loss on her daily quality of life. The astute clinician picked up on the family's report that she seemed more withdrawn recently and was not eating very well and although it might be worsened by her vision, these were felt to be signs of overlying depression. The ophthalmologist simply asked the patient "Did she feel sad or depressed often?" and she responded "yes" and elaborated on the additional issues concerning loss of function and independence and, in particular, the impact of her vision on her daily life. The ophthalmologist contacted the patient's primary care physician and she was evaluated and treated medically for depression. A low-vision consultation was obtained and the low-vision specialist was able to improve her vision with optical aids to the point where she resumed her crossword puzzles. Four months later, the patient's family sent a thank-you letter to the ophthalmologist thanking her for "giving their grandmother back to them." The patient returned six months later after treatment for her depression and was accompanied by her grateful family members.

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Visual Loss and Dementia

Andrew G. Lee

Case Vignette

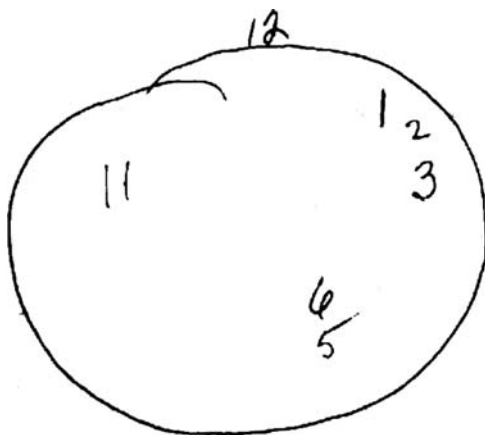
A 75-year-old tenured college professor is brought in by his wife with a chief complaint of “inability to read.” The wife is already physically disabled and in a wheelchair and relies on her husband for many of her activities of daily living. He has been to five ophthalmologists already and been given a dozen pair of new glasses which the wife has brought to the doctor in a brown paper bag. She states that he used to do the checkbook for the household but now cannot seem to balance the account properly. He has gotten lost in the grocery store three times this year and she would not drive with him anymore because she states that “he can’t see the road signs.” The patient is well groomed, articulate, and soft spoken. He makes several substitution errors during conversation however but quickly corrects himself (e.g., he stated that he drove his car to the airport today when he meant to say that he drove to the office visit). His students have been complaining to the dean that he rambles in lecture and often seems disorganized in class but he has full tenure and is the Chair of his department so no one wants to tell him about his problems.

The vision is 20/20 in both eyes. The pupil exam, slit-lamp biomicroscopy, intraocular pressure, motility, and fundus exam were all normal. He could not read the near card even though he identified all of the letters correctly on the J1 near line in each eye. He had a right complete homonymous hemianopsia on formal visual-field testing. The patient had undergone a magnetic resonance scan of the head prior to the visit and it showed only “cerebral atrophy” but no stroke, tumor, or other structural lesion in the left retrochiasmal pathway. A markedly abnormal screening clock draw test for visuospatial difficulties is shown in Fig. 1.

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Fig. 1 Clock draw of a patient with visual-variant Alzheimer dementia. Source: Reprinted with permission from the Department of Ophthalmology, The University of Iowa Carver College of Medicine



Introduction

Visual loss is associated with and may worsen dementia or delirium.¹⁻²¹ Uhlmann et al. studied 87 older patients with mild-to-moderate Alzheimer's disease and 87 nondemented age and sex-matched controls.¹⁸ The prevalence of visual impairment was higher in cases than in controls. Visual impairment was associated with both an increased risk for and an increased clinical severity of Alzheimer's disease. Visual loss can be a devastating comorbidity with dementia and patients with dementia may present with visual complaints (e.g., visual variant of Alzheimer disease). The patient with dementia may seem appropriate at first glance but probing for insight, memory, and executive function might reveal neurocognitive deficits. Lee and Martin described a retrospective case series of eight patients with Alzheimer's disease presenting with predominantly visual complaints. All of the patients had seen multiple eye care providers prior to referral to the neuro-ophthalmology clinic for visual complaints but without a diagnosis. Interestingly, four of these patients had homonymous hemianopic visual-field loss and two had presumed cortical visual impairment without a structural lesion on imaging. Neuroimaging studies in these cases showed either normal brain (one patient) or cerebral atrophy of the parietal or occipital areas but no structural lesions (seven patients). Fluoro-18-deoxyglucose positron emission tomography (PET) scans in five cases showed hypoperfusion in the parietooccipital areas. Formal neurocognitive testing revealed visuospatial deficits in all five patients tested. These authors concluded that visual symptoms might be the presenting or only manifestation of Alzheimer's disease and that clinicians should be aware of the visual variant of Alzheimer's disease, perform formal neuropsychological testing to document the deficits, and order magnetic resonance imaging (MRI) or PET scans to confirm the diagnosis and rule out other etiologies.²¹

Because visual symptoms might be the presenting or only manifestation of Alzheimer disease, the ophthalmologist should be aware of this presentation.

Unfortunately, the visual symptoms might precede the more classic memory or neurocognitive signs and symptoms of Alzheimer disease. The patient complaints are variable but can include difficulty reading (i.e., alexia), difficulty writing (i.e., agraphia), difficulty with staying on the correct line of text or finding the next line (e.g., homonymous hemianopsia), problems navigating even familiar environments, difficulty recognizing familiar objects (i.e., visual agnosia), difficulty with colors (i.e., dyschromatopsia), difficulty recognizing faces (i.e., prosopagnosia), or problems interpreting a complex scene (i.e., simultagnosia). The ophthalmologist may have difficulty making the diagnosis because the visual acuity is often normal (i.e., 20/20 OU), and the structural eye examination is unrevealing. Patients often arrive with multiple pairs of unhelpful glasses and a myriad of nonspecific or vague complaints. One of the big red flags for visual presentations of dementia is whether the chief complaint is “brought in by spouse for poor vision,” which might suggest a lack of insight on the part of the patient for their own deficits.

Levine et al. reported a patient with difficulty reading, problems driving, and peripheral visual-fields constriction. Over a 12-year period, the visual symptoms progressed, and at the postmortem examination there was cortical atrophy with abundant neurofibrillary tangles present in the occipitoparietal areas. Kiyosawa and Bosley reported 5 patients who had Alzheimer dementia with prominent visual symptoms. Three patients had relative right homonymous hemianopsias on visual-field testing. Prolonged saccade initiation, saccadic pursuit, unstable fixation, poor stereopsis, and impaired figure copying were also reported in these patients. Complex visual disorders are common in Alzheimer type dementia, including spatial and environmental agnosias (e.g., getting lost in familiar surroundings), simultagnosia (e.g., difficulty locating or identifying objects in a complex visual scene), prosopagnosia (i.e., inability to recognize faces), alexia, and optic and ocular apraxia. Giannakopoulos et al. used formal neuropsychologic tests to characterize visual loss in Alzheimer disease. These authors reported that associative visual agnosias reflected the density of neurofibrillary tangles, but not senile plaques in visual-association cortex. They differentiated apperceptive visual agnosias (i.e., perception of elementary properties of color or motion) from associative visual agnosias (i.e., the recognition of specific images such as faces and words). These authors concluded that associative visual agnosia represented visual-association cortex involvement and that apperceptive agnosia represented more diffuse cortical disease. Rizzo et al. described impairments in static spatial-contrast sensitivity, visual attention, shape-from-motion, color, visuospatial construction, and visual memory testing in Alzheimer dementia. Benson et al. described 5 cases with memory loss, alexia, naming deficits, Gerstmann’s syndrome (i.e., agraphia, acalculia, finger agnosia, and right-left disorientation), and Balint’s syndrome. All patients showed occipital and parietal lobe atrophy consistent with “posterior cortical atrophy,” and the postmortem evaluation in these patients has included Alzheimer dementia, subcortical gliosis, and indolent Creutzfeldt-Jacob Disease (CJD). Hof et al. reported 11 cases of “posterior cortical atrophy” and five had isolated visual disturbances. The diagnosis of visual type Alzheimer dementia was

made in these patients and there was a posterior distribution of their “senile” plaques and neurofibrillary tangles compared with nonvisual variant cases. It may be that the visual variant of Alzheimer dementia is not a separate entity but on the spectrum of presentations for Alzheimer disease. I believe, however, that it is clinically useful for ophthalmologists to consider the diagnosis of a “visual variant” of Alzheimer dementia because the visual symptoms may be the presenting sign prior to the other neurocognitive deficits and these patients are often seen by ophthalmologist first.

Perimetry

Ophthalmologists should consider visual-variant Alzheimer dementia in the differential diagnosis of patients who have a homonymous hemianopsia or cortical visual loss in the absence of a structural lesion on neuroimaging (e.g., stroke or tumor). Visual-field testing in patients with Alzheimer dementia may show non-specific constriction, a homonymous field loss, or bilateral homonymous loss. Trick et al. performed automated perimetry (i.e., Humphrey 30–32) on patients with Alzheimer dementia ($n = 61$ patients with 61 age-matched controls). In this study, the differential luminance sensitivity was decreased (especially in the inferonasal and inferotemporal arcuate regions) in the Alzheimer group compared with the age-matched controls.⁷ Brazis et al. described homonymous hemianopic visual-field defects in patients without a structural lesion on neuroimaging. One of these patients had Alzheimer dementia.¹³ Lee and Coleman also reported six patients with Goldmann perimetry testing and four of these patients had paracentral homonymous hemianopsias.²¹ Two of the patients however could not perform a reliable or valid formal visual-field test but confrontation visual-field testing showed nonspecific constriction OU. The inability to perform an accurate formal visual-field test may also be a sign of underlying dementia and should prompt consideration of Alzheimer dementia in older patients with visual complaints and a normal eye exam otherwise.

Neuroimaging

As mentioned above, the structural neuroimaging such as computed tomography or MRI may be normal or interpreted as “normal.” Typically patients with the visual-variant Alzheimer dementia show cerebral atrophy in the occipital and posterior parietal lobes (i.e., posterior cortical atrophy). As opposed to structural imaging (e.g., MRI), functional imaging (such as positron emission tomography (PET) scanning) can show decreased function (i.e., hypometabolism) in the involved parietal or occipital cortex in visual-variant Alzheimer disease.

Practice-Based Learning

Ophthalmologists do not need to diagnose and treat dementia, but they should be able to recognize the signs and symptoms of both the visual variant and nonvisual variants of dementia in their patients and make an appropriate referral. Earlier diagnosis and treatment is critical for the best results of therapy with the newer agents for dementia.

Communication Skills and Professionalism

Discussing difficult decisions with the patient with dementia requires special skills and tact. The patient with dementia often lacks insight into their own disability and may be brought in by their family members or spouse. Patients with dementia may insist on continuing in activities for which they are no longer competent such as driving or working. These activities (e.g., driving) may pose a hazard not only to the patient but to others. Careful and compassionate discussion with the patient and his family regarding the deficiencies and dangers requires extra time with the patient. A separate appointment might be a more appropriate time to discuss the issues in depth and with time for questions. In addition, timely communication with the primary care service or treating neurologist might be useful in discussing the special visual symptoms or needs of the patient with dementia and visuospatial presentation.

Systems-Based Practice

The patient with visuospatial manifestations of dementia needs a comprehensive and multidisciplinary solution. This includes the family members, the spouse, the primary care team, and the treating neurologist. Patients might need to undergo formal evaluation for driving risk. The patient is also the caregiver for the wife who suffers from severe rheumatoid arthritis. She is concerned that she will not be able to live independently anymore.

Patient Resolution

The patient underwent a useful field-of-view test that showed high risk. He voluntarily surrendered his driver's license. He was seen by neurology and formal neurocognitive testing was performed that demonstrated widespread and severe deficits in multiple domains but predominantly in visuospatial function. He was started on Aricept and had some modest improvement in his subjective function and agreed to step down as chairman of the department. The patient and his wife relocate to an assisted living facility.

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Visual Loss and Hearing Loss

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Case Vignette

A 65-year-old woman has age-related macular degeneration in both eyes. She has severe visual loss and can only see hand motions. Her family members report that she lives in a nursing home now but does not hear very well. She is depressed by her living situation and does not appear to recognize her family members. She has grown increasingly uncommunicative during family visits.

During her eye examination in your office, she is clearly having difficulty hearing, and the technician has to shout in her ear to get any response from her. The ophthalmologist who saw her previously had documented bilateral geographic atrophy secondary to age-related macular degeneration with 20/200 vision in both eyes. She was told “nothing more can be done” and comes to see you for a second opinion. The doctor becomes frustrated talking to the patient because she cannot hear well and begins to explain the situation to the accompanying spouse. The patient reacts angrily and states “Talk to me, not him.”

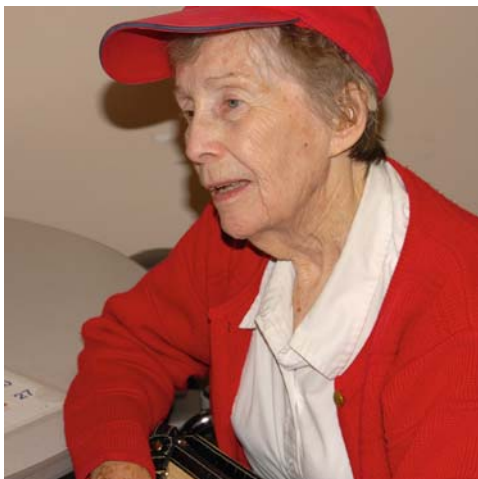
Introduction

Visual loss and hearing loss often occur together in the elderly. The presence of both sensory impairments increases the functional impact of either deficit alone. An ophthalmologist should recognize hearing loss and make an appropriate recommendation or referral for treatment in patients especially if visual loss is present as a comorbidity with the hearing loss (Fig. 1).

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Fig. 1 Many elderly patients suffer from the comorbidities of vision loss and hearing loss (note hearing aid). Source: Reprinted with permission from the Department of Ophthalmology, The University of Iowa Carver College of Medicine



Practice-Based Learning

Numerous studies have documented that hearing loss and visual loss are comorbidities that affect function and activities of daily living in older patients¹⁻³. Appollonio et al. reported that hearing and visual impairment resulted in higher mortality rates in an urban population of 1140 noninstitutionalized elderly subjects (aged 70–75 years). Keller et al. described the prevalence of visual and auditory impairment in frail older persons and evaluated the association between sensory impairment and overall functional status. Combined impairments of vision and hearing were common in the frail older outpatient population that was studied using the instrumental activities of daily living (IADL) scales. In addition, functional status was diminished for the sensory-impaired subjects and combined vision and hearing impairments had a greater effect on patient function than single sensory impairments alone. These results persisted even after controlling for decrease in mental status and other comorbid illnesses. Interventions to improve sensory function may result in greater functional independence although further study is needed in these areas.

Klein et al. in the Beaver Dam study documented the frequent coexistence of age-related macular degeneration (ARMD) and hearing loss.⁴ Because ARMD is a common cause of visual loss in the elderly, the potential impact of hearing loss as a comorbidity is extremely important. Concomitant hearing loss in this ARMD population is associated with difficulties in communication and diminishes other aspects of independent function (e.g., mobility, transportation) in patients who already have vision-related functional loss. Combined hearing and vision loss was found to be associated with the greatest likelihood of cognitive and functional decline⁵⁻¹² and emerging evidence suggests that treatment of both impairments can decrease this effect on functional decline.^{13,14} Wallhagen et al. also reported that

self-reported vision and hearing loss are associated with greater disability, decreased physical functioning, poorer mental health, and less social interaction 1 year after initial evaluation.¹⁵ It is important that the ophthalmologist be cognizant of the evidence that comorbid hearing loss can worsen the functional impact of visual loss.

Communication Skills

The ophthalmologist confronted with the elderly patient with both vision and hearing loss may become frustrated or tempted to “give up” on the patient. Although the evaluation and treatment of hearing loss is beyond the scope of practice for the eye care provider, it is the responsibility of every doctor to consider the needs of the whole patient. Although some forms of hearing loss in the elderly are not reversible, many are amenable to evaluation and treatment. Referral should be considered when hearing loss is apparent (e.g., having to shout at the patient), particularly if there has been no prior evaluation or attempt at treatment (e.g. hearing aids). The ophthalmologist in this setting has a duty to recognize the problem and appropriately refer the patient.

Professionalism

Part of the professionalism competency is recognizing and being sensitive to the unique needs of elderly patients with hearing loss. Talking to the spouse rather than directly to the patient isolates and marginalizes the patient. Not taking the history because the patient is unable to hear is suboptimal care. Patients with hearing loss who require extra effort or time can be asked to bring their questions in writing to their visit or to come to the office at a time when the provider is less pressed for time. Recognizing that the hearing loss is a unique extra need for this particular patient is part of the professionalism competency for ophthalmology.

Systems-Based Care

Ophthalmologists are not expected to treat hearing loss in the elderly but appropriate recognition of this important comorbidity and communication with the primary care provider or otolaryngologist might result in interventions that will improve the hearing loss and quality of life of the patient. Nonreferral of the visually handicapped hearing-impaired patient is a missed opportunity. In addition, the ophthalmologist may be the first or only point of contact for the patient with the medical system.

Summary

The diagnosis of age-related macular degeneration OU was made and low-vision services referral improved the patient's functioning (Fig. 2). The patient was referred to an otolaryngologist and underwent an audiogram. She was fitted with hearing aids bilaterally and although she still lives in a nursing home the family reports that she is better able to function in her activities of daily living. Although she initially seemed depressed by her living situation and had not been very communicative during family visits, after the hearing aid placement she "returned to her normal friendly and happy self" according to the daughter. When the patient returned to the ophthalmologist's office, she was pleasant and talkative and thanked the eye doctor profusely by helping her with her vision and hearing. She had been told by the other eye doctor that "nothing more can be done" and she expressed her gratitude and satisfaction with her second opinion with you.

Fig. 2 The appropriate use of visual aids, as well as counseling the patient in a quiet environment, the use of written as well as oral communication for patients with multisensory loss (note hearing aid). Source: Reprinted with permission from the Department of Ophthalmology, The University of Iowa Carver College of Medicine



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Visual Loss and Falls

Andrew G. Lee and David Steven Friedman

Case Vignette

A 75-year-old woman with age-related macular degeneration (ARMD) presents with new loss of vision in her right eye. Her past medical history is significant for hypertension, diabetes, and high cholesterol. Her medications are atenolol, insulin, simvastatin, and one aspirin per day. The patient is markedly hard of hearing and often forgets to turn on her hearing aids. She smokes one pack of cigarettes per day and has one glass of wine each evening. Her family history is significant for ARMD in her mother. The vision in the left eye was lost 2 years prior to presentation due to a subfoveal neovascular membrane from ARMD. She is the sole care provider for her elderly husband with Alzheimer's dementia, and they live together in their single family two-story home thirty miles from your office. The patient had driven herself and her husband to the appointment. Her daughter has been concerned about the increasing frailty of both parents, but the patient has refused to move previously. The patient has had four recent falls and was hospitalized one year ago for a hip fracture. The visual acuity was 20/200 in the right eye and counting fingers in the left eye. The pupillary, motility, slit lamp, external, and intraocular pressure measurements were all normal. Visual-field testing showed a central scotoma bilaterally. Ophthalmoscopy showed an old disciform macular scar from the prior subfoveal neovascular membrane in the left eye. The right eye showed a new subfoveal hemorrhage and underlying choroidal neovascular membrane.

Introduction

Visual loss is an important risk factor for falls in the elderly. The roles of the ophthalmologist include (1) identification of at risk elderly patients in the eye clinic; (2) risk reduction for falls; (3) low-vision assistance for patients with

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impaired vision that might reduce the risk for falls; and (4) communication of the risks and the risk-reduction techniques to the patient and the patient's caregivers. Vision plays an important part in stabilization of posture, and visual impairment may increase the risk for falls independently of environmental hazards.

The ophthalmologist should be aware that falls are one of the leading causes of injury-related death and disability in the elderly. Up to one in three older adults will suffer a fall per year and in 1997, almost 9,000 elderly persons died from their falls. A significant number of patients (up to 30%) will suffer reduction in their postfall mobility and independence. The most common fall-related injury in the elderly is a fracture (e.g., hip, vertebral, arm, pelvis, hand, or ankle). Obviously the most serious fracture is the hip fracture, which is one of the leading causes of older adult morbidity and mortality. Only half of elderly patients suffering a hip fracture are able to return to independent living at home and thus prevention rather than treatment of the fracture per se is the key. A hip fracture in an elderly patient is costly (up to \$18,700) during the first year following the injury and cost an estimated \$2.9 billion in 1991 medicare costs with projections up to \$240 billion by year 2040.

Practice-Based Learning

As visual loss is a risk factor for falls in the elderly, the ophthalmologist should be cognizant of the risks in an individual elderly patient¹⁻⁴. De Boer et al. examined contrast sensitivity in 1509 older men and women and prospectively over 3 years. The cohort was evaluated for falls and fractures and visual impairment was an independent risk factor for falls and fractures.¹ In the Blue Mountains Eye Study, a prospective population-based study of eye disease conducted in Australia, the 2-year risk of fractures in patients with visual acuity loss, visual-field deficits, and the presence of posterior subcapsular cataracts were found to be significantly higher than in persons without these findings at baseline.² Lord et al. performed a prospective cohort study ($N = 156$ community-dwelling elderly persons) and reported that impaired vision is an important and independent risk factor for falls, with depth perception and distant-edge-contrast sensitivity being particularly important for maintaining balance as well as detecting and avoiding environmental hazards.³

Of interest, central acuity alone may not be the only factor that is important. Lord and Menz assessed the impact on sway (a risk factor for falls) due to various visual factors (e.g., loss of contrast sensitivity, depth perception, stereopsis, and visual field) in 156 older persons aged 63–90 years. They concluded that vision and, in particular, contrast sensitivity and stereopsis are important for posture control under challenging conditions (no effect was seen on a stable surface). The ophthalmologist should be aware that these visual parameters (and not just whether a patient is 20/20 or not) are risk factors for falling in the elderly.⁴

Lord and Dayhew found that wearers of multifocal glasses have impaired edge-contrast sensitivity and depth perception, and that the use of multifocal eyeglasses substantially increases the risk of a fall. Furthermore, the population-attributable risk of falls in this cohort was found to be 35% for those wearing multifocal eyeglasses.⁵

Practice-Based Improvement

Buckley et al. studied the impact of visual impairment on the mechanics of landing during stepping down by elderly patients ($N = 12$) and concluded that correcting common visual problems might be an important intervention strategy for elderly persons negotiating stairs.⁶ A separate study reported that stair negotiation appears to be an important hazard for older persons.⁷

In a randomized controlled trial from New Zealand, Campbell et al. assessed the efficacy and cost-effectiveness of a home safety program and a home exercise program to reduce falls and injuries in community-dwelling older people with low vision (391 women and men aged 75 years or older with visual acuity of 6/24 or worse). Participants received a home safety assessment and modification program delivered by an occupational therapist ($n = 100$), an exercise program prescribed at home by a physiotherapist plus vitamin D supplementation ($n = 97$), both interventions ($n = 98$), or social visits ($n = 96$). The main outcome measure was the number of falls and injuries resulting from falls. These authors found fewer falls occurring in the group randomized to the home safety program but not in the exercise program — incidence rate ratios 0.59 (95% confidence interval [CI] 0.42–0.83) and 1.15 (0.82–1.61), respectively.⁸

In another prospective cohort study assessing the impact of vision on likelihood of falling, women with declines in visual acuity over 4–6 years were found to have significantly greater odds of experiencing frequent falling during the subsequent year. Odds ratios after adjustment for baseline acuity and other confounders were 2.08 (95% CI: 1.39–3.12) for loss of 1–5 letters, 1.85 (95% CI: 1.16–2.95) for loss of 6–10 letters, 2.51 (95% CI: 1.39–4.52) for loss of 11–15 letters, and 2.08 (95% CI: 1.01–4.30) for loss of >15 letters. This study lends further support to the conclusion that loss of vision among elderly women increases the risk of frequent falls and that prevention or correction of visual loss may help reduce the number of future falls.⁹ Yet another study of falls risk assessed 1285 persons over 65 years of age and found previous falls, visual impairment, urinary incontinence, and the use of benzodiazepines to be the strongest predictors of fall risk.¹⁰ In support of these findings from multiple studies reported here, one systematic review reported that visual intervention strategies to improve visual function and prevent falls in older people are warranted.¹¹

Fall-reduction techniques including safety measures might be useful for elderly patients with impaired or low vision. There is clear evidence that fall prevention is superior to fall treatment for elderly patients.

Systems-Based Learning

The ophthalmologist should consider contacting the patient's primary care provider as well as caregivers to inform them of the risks for falling posed by the visual loss in this elderly patient. Clinicians should be sensitive to the fact that an elderly patient may also be caring for an even more disabled or frail spouse. The loss of vision in this elderly caregiver thus might impact the care and quality of life of the spouse as well as the patient. The ophthalmologist may need to call upon the resources of a social worker, community assistance, or the family. Home safety inspections and home health visit to the patient's living quarters might provide an opportunity for fall risk reduction. Ophthalmologists should be aware of the factors that might increase the risk for falling in their elderly patient with visual loss (e.g., poor physical conditioning and lack of activity, muscle weakness, poor balance, preexisting difficulty with activities of daily living like dressing or bathing, cognitive impairment, dementia, and medications such as beta blockers, tranquilizers, sedatives, antidepressants). Ophthalmologists can help with fall prevention by recognizing patients at risk including elderly patients with visual loss and having a preprinted handout available for patients and their families that can address potential environmental home hazards (e.g., reducing clutter; improving stair railings; eliminating loose throw rugs or electrical extension cords, installing hand railing in the bathroom; and improving lighting and contrast especially on stairs). Falls in the elderly obviously impact the entire system of care including the patient, their care givers, and create potentially preventable costs to the health care system.¹³⁻¹⁵

Communication Skills

The ophthalmologist may be in a position to assist the caregivers in convincing an elderly and frail patient that transfer to an assisted living situation may be helpful in reducing the risk for falls and improving the quality of life. Empathetic and compassionate discussions with the patient and their family might be warranted in order for all involved parties to make an appropriate and informed decision on placement. Patients with visual loss often have hearing loss, and the risk for morbidity increases for patients with both hearing and visual loss. A delicate and sensitive conversation with the patient may be necessary regarding the issue of the legality and safety of driving in the setting of severe visual loss.

Patient Care Summary

The ophthalmologist should recognize that visual loss is a risk factor for falls. Patients with visual loss might benefit from specific counseling regarding risk-factor reduction, and specific home-hazard reduction recommendations might help prevent a fall.

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Elder Abuse

Hilary A. Beaver

Case Vignette

An 88-year-old female is transferred late in the day with a report of falling the previous night and striking her eye on the bedside table. She was initially evaluated at an outside emergency room, and then was seen by the local ophthalmologist with a diagnosis of an open globe injury. She was subsequently referred to the university hospital for further evaluation and treatment. She is agitated, abusive, and quite unhappy at having multiple exams by both the resident on service and the faculty. She threatens to leave without allowing further evaluation or surgical correction. The emergency room nurse checks the patient's blood pressure, which is elevated and has been climbing throughout her visit. The clinician sits and speaks quietly with the patient and family, eventually gaining her trust and cooperation.

The patient is confused regarding the cause of her fall. She habitually prefers an edge-of-bed sleeping position and states she may have rolled out of bed. Her family reports some generalized increase in confusion within the last few months, as well as an increasing problem with urinary frequency, both of which may have contributed to the fall. They report only a past medical history of treated hypertension, but her review of recent symptoms shows a series of recent falls. These falls do not appear to be due to poor prior vision. She has already undergone bilateral cataract surgery and functions well visually, but preoperatively had been highly myopic. Her exam confirms scleral rupture with uveal prolapse as well as multiple fading bruises on the extremities and trunk.

The clinician discusses the injury and the multiple ecchymoses with the patient again while she is alone. They ask her several times by varying approaches if she feels safe in her home and if she feels she is physically threatened or afraid. She states she feels unsafe in her home but that it is "all her fault," and that her children help her with her personal needs "whenever she asks for help." She denied that she has received any direct physical threats and

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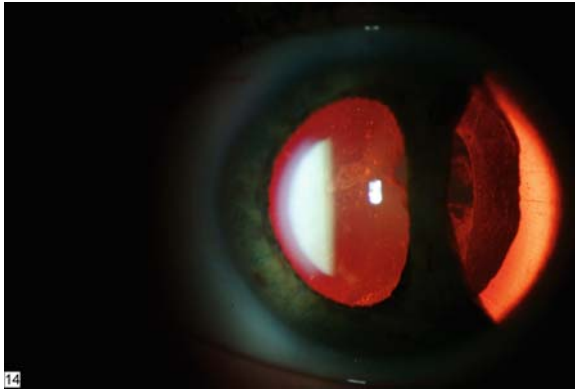


Fig. 1 Any evidence of significant ocular trauma in an older patient should raise the possibility of elder abuse. This patient received blunt trauma resulting in a traumatic cataract and iridodialysis. Source: Reprinted with permission from the Department of Ophthalmology, The University of Iowa Carver College of Medicine

has had no items taken from her against her wishes. Her children are all well employed, lead busy lives, and are financially stable without asking her for funds. The patient undergoes orbit and head CT in the emergency department, and subsequent repair of an extensive scleral rupture with repositioning of prolapsed uvea, but she remains no light perception vision.

The postoperative course becomes complicated the next morning. The patient develops poorly controlled hypertension and worsening generalized confusion, prompting a consult to Internal Medicine. Their service modifies her medications and recommends Physical Therapy and Occupational Therapy. Additionally, although they consider her mentally competent, they feel she is physically unable to independently return to her home. Physical therapy finds that she is only able to walk halfway across the room without assistance. You discuss this with her daughter; a family meeting is scheduled to discuss employing an “in home” elder care worker. A home review for falling hazards is also arranged through the patient’s family physician, including installment of bed rails and evaluation for trip hazards. Physical and Occupational Therapy begin a program of rehabilitation with the goal of reconditioning her to allow independent living.

The clinician and patient discuss hospital protocol, which requires a living will and medical power of attorney to be filed in the medical record for all admissions. The patient expresses a strong preference to retain a full code status. The clinician prepares her for transfer to a skilled care facility to work on strength training, and during a review of her electronic record reviews the final radiology report from her admission orbital CT. The radiologist suspects normal pressure hydrocephalus (NPH) based on the brain imaging associated with the orbital films. The clinician performs a review of the clinical signs and symptoms of NPH, then speaks with the children at the family meeting. Each child maintains loose contact with the mother, and they reveal that she has been

partially bedridden for several months with depression over the recent loss of her spouse. The patient states that her falling episodes preceded his death, and after some questioning reveals that the falls and her urinary symptoms have been increasing. She is reluctant to discuss her physical condition and insists that she is fine, but the children together are able to determine that she is now falling several times weekly. She still maintains that she is able to return home unassisted. The clinician consults the Neurology service, which confirms a likely diagnosis of NPH, recommending physical and occupational therapy to maximize the patient's physical condition. They reserve making a final diagnosis of NPH without demonstrated improvement in independent functional status after a high-volume lumbar tap. This assessment would not be currently interpretable given the patient's debilitated physical state. Both Neurology and Physical Therapy recommend Skilled Care Nursing for physical rehabilitation prior to an attempted high-volume lumbar tap. This is arranged through a Social Work Consult. The patient continues to be followed by ophthalmology, her primary service, and her vision remains no light perception. The Oculoplastic service is therefore consulted for anticipated enucleation within two weeks from her injury. Social Work subsequently notifies the clinician regarding Medicare regulations, which recommend any upcoming procedures requiring readmission be instead completed during this hospitalization. Discharge planning is deferred and the patient is held over the weekend for her surgery. She undergoes an uneventful enucleation, is placed in safety lenses, and is discharged to Skilled Care on postoperative day one.

Patient care

This scenario gives an excellent demonstration of the Patient Care Competency. The clinician communicates well throughout the case, first seen in the emergency department, where they calm the patient and gain her trust and that of the family. The clinician helps the patient to maintain her dignity, taking the medical history directly from her despite her confusion; the family was included in the discussion to ensure the accuracy of the history.

The Patient Care Competency covers maintenance of health and prevention of further medical problems. In this case, the most important initial health maintenance issue is the possibility of elder abuse. There are 700,000–1.2 million cases of elder abuse annually in the United States.^{1,2} Internationally 2–10% of patients over the age of 65 report a history of maltreatment³ and some extreme cases include labeling elderly women as “witches,” seizing of their property and abandonment.^{3,4} The United States Adult Protective Services reports an increase in reports of 19.7% from 2000 to 2004, with a similar rise in substantiated reports during that time of 15.6%.⁵ Unfortunately, less than 10% of estimated cases of older adult mistreatment are ever reported.^{1,2,6,7}

Although elder mistreatment includes physical abuse, it also includes neglect, exploitation, and abandonment, and may be manifested through unwanted

sexual contact, psychological abuse through humiliation or intimidation, and financial exploitation.^{1-4,6,8,9} Interestingly, neglect can also include “self neglect” (when the patient is unwilling or unable to care for themselves), but this may coexist with caregiver neglect where the caregiver fails to intervene in the self neglect.^{1,5,7,9} Although some abused elder patients complain of mistreatment, others may simply exhibit unexplained signs of physical trauma, poor hygiene, malnutrition, or dehydration.^{1,6,8} In other patients, they may simply appear to be withdrawn or may manifest symptoms of nonspecific anxiety or depression. The possible warning signs may be as simple as broken spectacles without explanation, noncompliance with prior treatment instructions, or unexplained missed appointments and thus do not have to include direct evidence of ocular or periocular trauma. Cases of suspected abuse should be reported to the authorities, and reporting is mandatory in 42 states.^{8,10} The Clinician in this case recognizes the risk of abuse in this elderly patient and pursued it appropriately. The diagnosis is suggested not only by the severe ocular trauma, but also by multiple ecchymoses evidencing past trauma of different times.

A highly sensitive but nonspecific test for elder abuse is the Elder Assessment Instrument (EAI). This 41-point Likert scale reviews signs, symptoms, and complaints consistent with elder mistreatment and requires approximately 12–15 minutes to complete. The EAI includes a general assessment of clothing, hygiene, nutrition, skin, and any evidence of trauma or sexual abuse. It includes self-reported comments of neglect, abuse, abandonment, or exploitation, evidence of depression, and any physical signs of neglect including decubiti, contractures, diarrhea, urine burns, impaction, and evidence of poorly monitored medication (over or undermedication) or health care regimens. Additional evidence of either misuse of finances or caregiver demands for financial reimbursement and abandonment by the caretaker for periods inappropriate to the patient’s needs conclude the EAI. Although there is no specific scoring protocol for the EAI, any evidence of abuse, neglect, exploitation, or abandonment should be reported to the proper authorities for further investigation.¹ Currently health professionals underreport suspected mistreatment, in part from missed diagnoses, and in part due to conflicts over reporting the information counter to the wishes of their competent older patient. These patients may have guilt about or fear of retribution, institutionalization, or embarrassment by the exposure of their situation and may refuse assistance.^{1-3,7,9}

Five Common Manifestations of Adult Maltreatment (Adapted from. Lachs et al.³)

- Physical abuse: intentionally causing physical pain or injury
- Psychological abuse: Intentionally causing emotional pain or injury
- Sexual assault
- Material exploitation: misappropriation of money or property
- Neglect: failure of caregiver to meet the needs of dependent elderly

This clinician also contributes to preventative health by addressing the patient's future risk of falling. They notified the primary physician, who arranges for home bed rail installation and fall hazard assessment. The ophthalmologist also recognizes the increased risk of ocular injury in the remaining eyes of monocular patients and prescribes the patient full-time safety glasses at discharge from the hospital.

Finally, the patient-care competency covers not only clinician competence in medical and surgical procedures but also recognition of the need for external consultation for problems outside of an individual clinician's training. In this scenario, the clinician competently cared for her ocular injury and surgically managed her globe rupture. They interacted with outside healthcare providers for issues outside of ophthalmology, including those in Emergency Medicine, Radiology, Internal Medicine, Neurology, Occupational Therapy, Physical Therapy, Social Work, and Oculoplastics. The primary ophthalmologist continued to coordinate care for the patient, and to counsel the patient and the family regarding her ongoing options for treatment.

Medical Knowledge

The practitioner used their general medical knowledge to analyze the multiple presenting symptoms, diagnosing and treating the patient's ocular, hypertensive, and neurological problems. Those areas of medical care outside of the practitioner's area of practice were appropriately triaged, a coordination of care which demonstrates overlap between the medical knowledge competency and that of patient-centered care. The clinician entertained but discounted the likelihood of elder abuse as a unifying diagnosis in this case. The presentation of an elderly, confused female with severe ocular trauma and multiple ecchymoses of varying ages matches the common profile of the abused older patient. The abuse is usually performed in the patient's home, 90% of the time abuse by the children or spouse. The victim is often physically and socially isolated, dependent, demented, elderly (especially over the age of 80), and female. Unlike the caregivers in this case, the perpetrators of elder abuse are often financially dependent on their victim. Caregivers may be under personal stress, and may be ignorant about and frustrated by the demands of caring for an elder relative. The abuser manifests their desperation by intentionally inflicting pain, injury, or anguish on their elderly charge. The risk of abuse rises when there is other violence within the household, and the acts may be exacerbated by caregiver substance abuse or mental health disorders.^{1,3,6-9} The risk is greater for the elderly living alone as there is less opportunity for contact and conflict. Financial abuse however is more frequent for elders living alone. Abuse also occurs in institutionalized settings. Sadly, the 3-year relative mortality in older patients with a history of abuse is 3 times that of age-matched controls.³

Eight Red Flags for Elder Abuse (Adapted from Purdy¹⁰)

- Repeated visits for medical care (ER or office)
- Conflicting, noncredible history from caretaker or patient
- Unexplained delay in seeking treatment
- Unexplained, inconsistent, vague, or poorly explained injuries
- History of being “accident-prone”
- Patient ambivalence, anger, or fear toward caregiver
- Poor compliance with scheduled follow-up or care regimen
- Physical evidence of abuse

Interpersonal Skills and Communication

The sections within the interpersonal skills and communication competency also overlap with those of patient-centered care. In this case, the clinician updates the patient and their family as various medical and ophthalmologic issues develop. This includes the care of the initial open globe injury, the subsequent poorly controlled hypertension, the diagnosis of NPH, the eventual need for enucleation, and the need for skilled care nursing for physical rehabilitation. Communication skills are needed for the discussion of the patient’s mental competence, and the discussion leading to documentation of code status, a living will, and medical power of attorney.

It is important in this case to communicate with both the patient alone and then separately in conjunction with her family. The initial history is confirmed by the family, given the patient’s confusion at presentation, but repeated with the family absent when investigating the possibility of elder abuse. The potential abuse history should be taken in a nonconfrontational, nonjudgmental fashion, as abused older patients often suffer a sense of guilt and shame regarding the abuse. Patients may deny the occurrence of maltreatment and may decline intervention on their behalf.

Nine Questions to Ask a Suspected Victim of Adult Mistreatment²

- Has anyone at home ever hurt you?
- Has anyone ever touched you without your consent?
- Has anyone ever made you do things you didn’t want to do?
- Has anyone taken anything that was yours without asking?
- Has anyone ever scolded or threatened you?
- Have you ever signed any document that you didn’t understand?
- Are you afraid of anyone at home?
- Are you alone a lot?
- Has anyone ever failed to help you take care of yourself when you needed help?

Professionalism

The professionalism competency interweaves ethics and medicine and involves putting patient and societal needs above those of the doctor. This competency relies on the competencies of communication and patient care, without which it is difficult to recognize the patient's needs or to coordinate appropriate care. In this example, it would have been far easier for the treating ophthalmologist to address only the open globe and to discharge the patient to the care of the family and the primary physician. This would have not have addressed the possibility of elder abuse, and would not have uncovered the diagnosis of NPH nor optimized her care with skilled nursing placement and rehabilitation.

Other professionalism issues arise in this case. It is in society's financial interest to address the spectrum of her acute and subacute diagnoses. Part of the professionalism domain includes placing the patient's and society's interests ahead of the physician's interests. The clinician also respects the patient's wishes for aggressive treatment despite pressure from the family. Although the patient is older and has times of confusion, she is competent to make her own decisions. She is within her rights to prefer a full neurologic evaluation to maintain and hopefully to improve her quality of life and her activities of daily living.

Finally, by becoming involved in the extensive evaluation of this patient, the ophthalmologists themselves learned more about NPH and fall prevention in the older patient, and both educated the ophthalmology resident and the other medical teams about eye trauma. This scenario demonstrates professional, patient-centered, preventative care by addressing all of the patient's medical needs and by addressing ongoing professional development and education in both the clinician and the consulting services.

Practice-Based Learning and Improvement

There is also overlap between the practice-based learning and improvement and the professionalism competencies. The professional physician applies new knowledge gathered from each patient encounter to learn and to improve their own patient care. The physician in this scenario applies skills learned from past trauma cases and recognizes the dangers of falls in the elderly for fractures and mortality. The practice-based learning competency covers the use of information technology in managing patient care. The clinician in this case uses computer information technology to access the electronic medical record, reviewing the final CT report, as well as to access online information about NPH. Their literature search led both to specific questioning of the family and patient and to consultation of neurology.

This case was ultimately presented to departmental morning rounds as a Clinical Pathological Conference (CPC). The CPC covered both the pathological findings as well as a discussion of patient-centered care, systems-based

practice, and medical knowledge competencies. This case therefore provided the entire ophthalmology department an opportunity to learn, exemplifying the definition of the practice-based learning and improvement competency.

Systems-Based Practice

The system of care is particularly important in cases of suspected elder abuse. Every individual who comes in contact with older patients should be aware of the prevalence of elder mistreatment and recognize the possibility of self neglect as abuse. A clinician suspecting neglect or abuse should access their state's reporting network. Every state has laws governing elder mistreatment, and in most states the reporting of elder abuse is mandatory.^{1,2,8}

Elder abuse is both a social and a medical condition, as are child abuse and domestic violence. The findings of elder abuse are not specific, and there is not a specific definition of nor a specific test for the condition.³ The abuse itself is rarely witnessed, and the victim often tries to hide the condition out of shame and to refuse intervention on their behalf.^{3,7,9} Complicating the issue further are cultural variations on both the perception of what constitutes abuse and the willingness to portray the family in a negative light.^{3,4} It is important as a clinician to recognize the possibility of abuse and to report suspected cases to those authorities trained to assess the individual and situation. This needs to be done without further endangering the older patient or risking loss of access to that individual.³ In many cases, the optimal solution is not to remove the elderly person but to treat the abuser's underlying social and psychological problems, retaining the family unit and allowing the older patient to remain at home.⁷

Elder Abuse Resources (Adapted from Aravanis² and Kleinschmidt⁷)

- Hotlines, 24 hour: available in most states
- Social Services
- Adult Protective Services or Department on Aging: these are state run with legal responsibility and authority to investigate complaints and provide services for elder wellbeing
- Law enforcement officials
- National Center on Elder Abuse
202-682-2470, 202-898-2586
Fax 202-898-2583
<http://interinc.com/NCEA>
NCEA@nasua.org
www.elderabusecenter.org
1201 15th Street, NW, Suite 350
Washington, DC 20006

- Long-term Care Ombudsman Program: A federally legislated program for reporting suspected abuse of institutionalized patients
- Medicaid Fraud Control Unit: Run by the state attorney general's office, required by Federal law to investigate and prosecute provider fraud or elder abuse in facilities receiving Medicaid funding.

This case description encompasses the entire system of care in an elderly patient with an open globe. The system of course goes beyond the traditional “doctor–patient relationship” and includes the outside emergency department, physician, and referring, consulting, and treating ophthalmologists, the university emergency department, physician, nurses, and rest of the ophthalmology staffing team, the internal medicine, radiology, neurology, and oculoplastic services, physical and occupational medicine, social work, and skilled care nursing, as well as the dietary, nursing, and custodial services for the inpatient ward. The system of care is a network involving everyone who participates in a patient's care, thus also included the patient's family, her primary care practitioner, her insurance entity and their insurance regulations. Each member of this extensive healthcare team provided a unique and valuable contribution. It is up to the admitting physician to help the patient to navigate the system for the best care. Doing so interweaves the competencies of communication skills and patient-centered care, professionalism and clinical knowledge, maximizing the best use of resources without compromising care.

Case Resolution

After consultation with the children, they preferred to defer the large volume tap and possible subsequent shunt procedure and request that neurology not further address NPH directly with the mother. The clinician explains that because their mother is considered mentally competent, she must be legally allowed to make her own medical decisions. The family discusses their concerns with the patient and she elects to pursue follow-up care with neurology after physical rehabilitation. She is presented with the evaluation from physical therapy and finally agrees she is unable to navigate her own house. She is willing to be admitted for skilled care and rehabilitation with the goal of returning home. Her family, though individually busy, agree to visit with her on a rotating basis providing adequate oversight. This scenario demonstrates an example of self-neglect and the absence of an identified family caregiver or group family caregiver mentality. Social intervention is able to redirect the patient and her family, allowing her to return eventually to her own home once it is modified for an elderly individual.

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Functional Impairment and Visual Loss

Gwen K. Sterns

Case Vignette

An 87-year-old woman, recently lost her husband of 65 years, moved in with her daughter in a town 100 miles from where she had lived for the past 60 years. Her daughter was aware of her mother's poor vision knowing her mother had been diagnosed with macular degeneration several years earlier. She knew her father had to read recipes to her when the print was small but also knew her mother prepared meals, used the stove, microwave, dishwasher, and other appliances with no difficulty. Her mother kept her mind active listening to the news, talking with friends, and having lunch out of her home with her husband and friends at least twice a week. Also she knew her mother had cared for her father during his final months of life at home. Her mother was hesitant to move in with her daughter as she did not want to be a burden to her and was quite comfortable in her own home. Her mother had friends who offered to take her shopping and out to socialize. Her daughter prevailed and her mother sold her home and moved in. At first things seemed to be going well but soon, when her daughter returned to work, her mother was left alone in the house. She burnt some food in the microwave oven, thinking she had set it for only 40 seconds but later found out it was for 2 minutes. When using the stove she set the temperature too high and forgot to shut off the gas burner. She was unable to get the television channel she so liked and gave up watching her show. Over a short time she had withdrawn from family activities, seemed to be losing weight, and seemed to be depressed. Her daughter brought her to see her doctor who specialized in geriatrics and her ophthalmologist to see if her mother's vision had deteriorated.

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Practice-Based Learning and Improvement

Functional visual loss can be exacerbated by worsening of the eye disease and also by a change in the social and environmental setting. Most persons with permanent vision loss can be assisted with properly selected optical and non-optical aids. The remaining vision is maximized to restore the person's ability to function and maintain a sense of self-sufficiency. For the elderly person, visual assistance may provide a new outlook on life, preventing depression because of an inability to read, write, or maintain hobbies (Fig. 1).¹ Exploring the opportunities available for the visually impaired is extremely gratifying, for the patient and the provider. As people age, a change in their physical surroundings can prove difficult to adjust to and those with visual impairments have not only that to contend with but also relearning tasks that they previously performed in the former environment. The vision loss led to some functional vision loss as well. When this patient was first diagnosed with macular degeneration she had difficulty reading labels on medications, reading the newspaper and directions on the back of boxes. She could not see the dials on her microwave or the stove. With low-vision aids and a low-vision rehabilitation specialist she was able to master these tasks in her own home. Her husband was there to assist her when she had some difficulty but for the most part she functioned very independently. Recognizing these changes and providing training in the home, labeling the dials in her daughter's kitchen with high marks, and updating her low-vision devices she would then be able to function without assistance.



Fig. 1 The loss of strength and mobility with age are compounded by the loss of vision, increasing the risks of falls and fracture. Addressing reversible causes of vision loss can greatly increase an elderly patient's independence.

Source: Reprinted with permission from the Department of Ophthalmology, The University of Iowa Carver College of Medicine

Patient Care

It is the role of the doctors caring for these patients to make sure low-vision care is provided either on site or by referral to a low-vision specialist.

The vision loss is a medical problem which in this case can lead to withdrawal and depression. The doctor caring for this woman needs to relate her eye disease to her functional vision loss. Our history should include a functional history as well as the goals and expectations of the patient and family. Then can we begin to provide needed low-vision care. The patient went to her daughter's ophthalmologist to confirm her diagnosis and to be sure that her eye condition was stable and nothing else was developing that would need treatment.

Medical Knowledge

Functional vision loss caused by eye disease or neurological involvement may affect people in different ways. The relationship between eye disease and functional vision has been well described by Eleanor Faye, MD. Her work on this subject enhanced our understanding of the functional implications of medical disease.^{2,3} Understanding these concepts has led to improved evaluation and management of patients in need of low-vision rehabilitation.

Visual deficits are divided into three categories: cloudy media, central field deficit, and peripheral field deficit. Cloudy media may cause a generalized blurring or haze. Patients with recent vitreous hemorrhage or a dense cataract may complain of blurry vision. Details may be hidden and patients may be troubled by glare. Absorptive lenses can help by improving contrast and reducing the glare. Central deficits, as seen in patients with macular degeneration, may make near tasks difficult. Details of their face may be distorted or blurred in the center although they can see their forehead and chin but not details of the middle of their face. Reading and fine work may be difficult. Magnification may help improve the performance of the patient with a central field loss. Peripheral deficits, as sometimes seen in people with advanced glaucoma, retinitis pigmentosa, or brain disorders affecting the optic pathways, cause difficulty with mobility or seeing in dim illumination. Affected patients may have trouble crossing the street or moving easily in a crowded mall. Depending on the severity and involvement of the eye, diabetic retinopathy can cause central and peripheral vision loss. Central loss in diabetics can be seen when the macula is involved and peripheral loss may follow a dense vitreous hemorrhage or a traction retinal detachment. Considering the type of functional vision loss can help the practitioner to plan for the optimal rehabilitation of the patient. This patient has macular degeneration and in her new environment she had difficulty with reading the labels and directions, setting the stove and microwave oven. Her ability to function independently was threatened. An understanding of the functional loss would have prepared both the mother and daughter before the

move so that the appropriate optical and nonoptical aids could have been introduced and updated for the new environment.

Interpersonal and Communication Skills

The ophthalmologist recognized the concern of both the daughter and her mother. The ophthalmologist was able to put the daughter at ease that her mother's eyes were stable and that she had not lost any further vision. He also was able to understand the difficulty experienced by the mother. Her move exacerbated her depression over the loss of her husband. She had to give up many things including her friends who over the years she had come to count on and share life's events. This alone would have been enough but the environmental change with little preparation to the new home left her in a dependent position.

Professionalism

The ophthalmologist put the family in touch with local vision rehabilitation services. An appointment with a vision rehabilitation specialist and a low-vision physician was arranged. The ophthalmologist also contacted the internist to discuss the medical condition of this patient and to discuss the depression she was experiencing. He asked the internist to see and evaluate the patient for possible intervention.

Approach to the Visually Impaired Patient

When greeting a visually impaired patient, the doctor or the doctor's assistant should introduce themselves to make the patient aware of their presence. The person accompanying the patient through the office should always offer his or her arm to the blind person. With her hand lightly on the arm, the patient feels the movement of the assistant's body, and because the assistant will be slightly ahead of her, she will have a feeling of confidence. To be propelled from behind can be awkward. One should ask a blind person if she needs help, not forcing assistance. The patient should be escorted to the examination room, and the patient should be told where the furniture is within the room. The patient's hand is placed on the chair or table so the patient can position herself properly.

Any paperwork needed to be completed by the patient should be handled in a private setting by an office staff member rather than a driver or friend. The patient may not want to share confidential medical information with another person. If a blind person has been left by herself, she should be told about her surroundings. It is desirable orient the visually impaired person to the room by telling them where things are such as a table, chair, or wall and to let the patient know if the door will be left open, so the patient can call out for assistance if needed.

Systems Based Practice

The effect of eye disease on the functional vision loss needs to be recognized. Most persons with irreversible, subnormal vision can be assisted with properly selected optical aids.

It is the role of the doctors caring for these patients to make sure they receive low-vision care either on site or by referral to a low-vision specialist. We need to treat the vision loss as a medical problem and relate the diagnosis to a functional vision loss. Our history should include a functional history as well as the goals and expectations of the patient and family. Only then can we begin to treat and provide needed low-vision care.

Case Resolution: System-Based Practice

The ophthalmologist took care of the patient by making appropriate referrals to treat the whole patient and not just the eye pathology. He understood the relationship of vision loss to loss of independence and depression. He understood the functional vision loss of the patient and immediately could understand her difficulty with the oven and microwave. Being able to see the whole picture enabled him to provide the best care.

The patient visited the low-vision clinic where she was able to have her low-vision aids adjusted for her new environment. She also was put in touch with a group of contemporary folks with vision loss so she might be able to share her experiences. A vision-rehabilitation teacher visited the home and marked the dials on the kitchen appliances enabling the mother to see them. A large-numbered telephone was purchased as well so she did not have to try to see the portable phone located around the house with “tiny” numbers. Additionally, a new remote control device for the TV was purchased for her to enable her to see what she needed to. Both daughter and mother learned to share their fears and concerns and agreed to keep each other informed so they could have open communication.

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The Research Agenda-Setting Project (RASP)

David Steven Friedman and Andrew G. Lee

In 2001, the John A. Hartford Foundation and the American Geriatrics Society set out to publish in a book format a research agenda-setting process (RASP) to achieve the following goals: (1) to increase research activity in the field of geriatrics within specific surgical and related medical specialties; (2) to attract new specialty researchers to study and subsequently meet the unique needs and requirements of the older patient in these specific surgical and related medical specialties; (3) to increase the number and quality of age-related research grant applications (e.g., National Institutes of Health, the Department of Veterans Affairs, and other agencies); and (4) to improve the well-being of older patients in specialty care. The process involved the selection of faculty members from each specialty to serve as content experts and writers and to review and eventually to update the present status of research on the geriatrics aspects within their respective specialties. For ophthalmology, these authors were Anne Coleman, MD and Andrew Lee, MD. The content experts met at the RAND Corporation in Santa Monica, California in February of 2001 to receive systematic instructions on “how to conduct a systematic literature review”; “how to classify research by type of study design”; and “how to develop preliminary search strategies.” The searches were coordinated by professional RAND librarians and an iterative process followed with contribution from the senior writers, the content experts, and the librarians. The group revised their search strategies and individually reviewed selected titles, abstracts, and eventually specific full papers. The content experts were at liberty to expand the searches independently but in all cases the reference lists were searched for additional relevant earlier publications. The literature reviews were conducted using an English-language search, limited to human subjects of MEDLINE (through PubMed or DIALOG). The search terms were for “65 or older” or “aged” or “geriatric,” followed by a list of content topics of importance in each specialty. The earliest year searched varied (1980–1994) and the latest year was the first half of 2001. A research consultant maintained a full list of titles from each

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literature search in an EndNote database and the project director and the research consultant reviewed the titles and abstracts (where necessary) for relevance to the cross-cutting issues section. The research consultant also obtained full-text copies of the papers; forwarded these papers to the Senior Writing Group; added new references as needed to the EndNote database; and verified the accuracy of the final list of citations.

The first drafts were reviewed by the editors, and additional revisions were made and finalized at a face-to-face conference in Potomac, MD, in November 2001 cosponsored by the Agency for Healthcare Research and Quality (AHRQ). The RASP is the final product of this effort. Ophthalmology is proud to have participated in the RASP.

Each RASP chapter includes the following: (1) key elements of the literature review for that specialty or for the cross-cutting issues; (2) a complete reference section at the end of each chapter; (3) individual sections ending with the pertinent research agenda setting items with a unique section identifying number to facilitate cross-referencing and citation; (4) discussion of the issues of most concern in the care of older patients by practitioners in the specific discipline; (5) key research questions with the highest priority in the opinion of the experts participating in the project; and (6) examples of hypothesis-generating and hypothesis-testing research needed to address each key question. Each of the agenda items in each section was labeled with a letter from A to D (designating the type of research design and the clinical priority or importance of the proposed study). In the RASP, the word level was not intended to imply degrees of quality and was defined instead as follows:

- Level A identifies important studies with hypothesis-testing intent, using such designs as randomized controlled trials, certain nonrandomized controlled trials, or those cohort studies that focus on a single hypothesis.
- Level B identifies important studies with hypothesis-generating intent. Designs would include exploratory, multitargeted cohort and case-control studies; retrospective or prospective analysis of large databases; cross-sectional observational studies; time series; outcome studies; retrospective case series; or post hoc analyses of randomized controlled trials.
- Level C identifies hypothesis-testing studies judged by the content experts to be of lesser importance and priority than those labeled A.
- Level D identifies hypothesis-generating studies judged to be of lesser importance than studies labeled B.

In the RASP, the proposed A (or C) studies generally must be preceded by B (or D respectively). Although A studies in general would rank higher in terms of the quality of the evidence they would provide, B studies often have sequence priority over A studies because of cost, logistical, and ethical issues surrounding designing and implementing an “A” study. All of the elements in the RASP book are indexed by topic with discussions of the literature in all the specialty fields and for each cross-cutting issue, specific studies by name, tables and figures, the agenda items and key questions, descriptions of research design, as well as the

project history and methods. A follow-up to RASP 1 (i.e., the RASP supplement) was performed to update the literature from 2000 to 2005 and used a similar methodology to the above. For ophthalmology, the authors were Andrew Lee, MD and David Friedman, MD. The entire RASP book and the supplement are available through the AGS at <http://www.americangeriatrics.org/specialists/NewFrontiers/chapter.asp?ch=1>.

Some examples of the research questions from the RASP supplement for ophthalmology are listed below:

Ophth KQ1: Does visual improvement or stabilization, including low-vision rehabilitation, reduce the severity, incidence, and prevalence of depression, dementia, delirium, falls, driving accidents, loss of function or quality of life, and hospital complications in the elderly population?

Ophth KQ2: What is the best timing for and what are the best methods for intervention in visual loss in the elderly person, and what are the best outcome measures for documenting success?

Ophth KQ3: What are the risk factors for functional vision impairment in the elderly person, and what screening intervals and methods and what instruments for measuring visual function would be best for identifying an older person's risks for such impairment?

It is hoped that the RASP will assist researchers in the field of geriatric ophthalmology by providing ideas and background for research (Fig. 1). The interested reader is directed to the AGS website for further information. <http://www.americangeriatrics.org/specialists/NewFrontiers/chapter.asp?ch=1>.



Fig. 1 Progress in medical research has given new hope to many elderly patients facing the ophthalmic diseases of aging. The Research Agenda Setting Process hopes to bring clinical research to application at the chairside. Source: Reprinted with permission from the Department of Ophthalmology, The University of Iowa Carver College of Medicine

Screening for Comorbidities

Sushma Yalamanchili

Case Vignette

An 82-year-old white female is referred from an assisted living facility to the eye clinic for “redness” of the left eye. She does not answer questions when spoken to and appears to have a blunted affect. She is uncooperative in reading the eye chart. It is very difficult to assess her visual acuity. According to the assisted living facility she does wear glasses and has a history of cataract extractions in both eyes. She is currently only on medication for hypertension. Recently she has become less and less responsive to her environment.

Introduction

This is a patient in whom the history and exam are difficult. Despite the challenges, it is important in these cases to do a comprehensive exam and to screen for possible comorbidities that normally would be able to be elicited on history from a more cooperative patient. From the ocular standpoint, does she have cataracts, glaucoma, age-related macular degeneration, or another retinal disorder? Is there any sign of hypertension or diabetes on retinal exam? Does she have a history of depression or dementia? Does she have a history of severe hearing loss? Is there a family history of depression or dementia? Has there been a recent traumatic event in her life? These are all important questions to ask and consider during the history and physical. Addressing the competencies in patients in whom the cooperation is poor is a particularly challenging aspect to working with elderly patients in institutional settings.

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Fig. 1 Routine preoperative evaluation as part of the system of care (including nurses and technical staff as shown) may reveal systemic comorbidities of aging and prompt referral to primary care. Source: Reprinted with permission from the Department of Ophthalmology, The University of Iowa Carver College of Medicine

Practice-Based Learning

In assessing a patient who is unable to communicate, it is sometimes more efficient to start with a thorough exam first. One should assess for other possible comorbidities. It is very important for example to look for the common and treatable problems first like refractive error. A cross-sectional population-based study done in Australia of almost 5000 elderly people found that uncorrected refractive error was the most common cause of bilateral visual loss.¹ If a patient is uncooperative with the exam, it is also reasonable to do a cycloplegic refraction to assess for a potential refractive error. It is important not to miss the basics and address possible common problems first.

Since most major eye diseases occur with greater frequency among older adults, the rates of visual impairment will increase as the population ages and lives longer. The leading cause of blindness in white Americans is ARMD, but for black Americans the leading causes are cataract and glaucoma.² Next, in a large population-based study in India, cataract was a common cause of visual impairment even in people in their 50s.³ Thus, it is important to pay particular attention for these treatable possibilities on the exam. Doing a thorough retinal exam and even possibly an ultrasound if there is a dense cataract to visualize the back of the eye and rule out a retinal detachment or mass may be necessary.

Systemic conditions may also contribute to a decline in vision. Wallhagen et al. found that vision and hearing loss self-reported by patients have strong independent effects on disability, physical functioning, mental health, and

social function one year after initial evaluation.⁴ In one large cohort study of risk factors for cognitive and functional decline, combined hearing and visual loss was found to be associated with the greatest likelihood of cognitive and functional decline.⁵ Hence a referral to an otolaryngologist may be in order.

Depression and dementia also should be considered. Horowitz et al. conducted a descriptive study of the effects of specific rehabilitation services (e.g., low-vision clinical services, skills training, counseling, optical device use, and adaptive device use) on depression among 95 older patients with age-related vision impairments. Hierarchical regression analyses indicated that low-vision clinical services, counseling, and the use of optical devices each significantly contributed to a decline in depression.⁶ During the exam, it is thus important to assess the patient's overall affect and body language. Are they more withdrawn lately or less responsive than usual? Depression can also mimic or exacerbate ocular complaints and should be investigated if possible.

In addition, hypertension and diabetes may contribute to decrease in vision. There may be a vitreous hemorrhage or tractional retinal detachment secondary to diabetes or an unrecognized vascular occlusion. A retrospective study of the charts of 93 inpatients (half of whom had suffered strokes) who were referred to a low-vision rehabilitation clinic found that on average the visual acuity was moderately impaired and that this interfered with the activities of daily living. A high proportion of those referred were believed to benefit from new eyeglasses correction or vision aids.⁷ In conclusion, all patients whether or not they are able to communicate their needs must be assessed in an open-minded arena.

Communication Skills

Although the evaluation and treatment of some of the diseases above are beyond the scope of practice of the eye care provider, it is the responsibility of every doctor to consider the needs of the whole patient. Thus, appropriate referrals should be made. Every aspect of the patient should be addressed. If there is any change in physical appearance or demeanor, it should be stated in the chart and addressed for this may be early signs of depression or dementia.

System-Based Learning

The ophthalmologist should consider calling the primary care provider as well as caregivers to inform them if there are any new ocular problems contributing to the blunted affect or vice versa. The ophthalmologist may need to use social workers, community assistance, or family to help with any adjustments in vision. Patients with new visual loss might benefit from significant counseling regarding home hazard reduction and adjustments in daily living. Ophthalmologists are not expected to treat depression, dementia, diabetes, hypertension, or hearing loss. However, appropriate recognition of comorbidities and communication with the

primary care provider or subspecialists might result in interventions that will improve these diseases and quality of life of the patient.

Professionalism

Part of the professionalism competency is recognizing and being sensitive to the unique needs of elderly patients who may not be able to express their own needs. Thus talking to family members and the assisted living facility to obtain an adequate history would assist in providing optimal care to the patient. A patient's chronological age is not as important as their ability to function daily and meet their social needs. It is important to be sensitive to an older patient's specific needs and desires and try to improve on them.

Patient Care Summary

In this particular patient, the diagnosis of acute depression was made by her primary care physician most likely secondary to the recent death of her spouse. She had a prior history of hearing loss that was corrected with hearing aids. However, with the recent loss of her spouse, she did not wear either her hearing aids or her glasses.

A new refraction was given to the patient based on a cycloplegic exam. The patient was referred to a psychiatrist and support group. After appropriate antidepressants and therapy were started, the patient returned to the ophthalmologist and was able to communicate enough to obtain a visual acuity and express her needs. She stated she was happy with the glasses given to her, but her eyes sometimes felt scratchy. The patient was given a prescription for artificial tears and expressed her gratitude for the care provided. She was still very affected by the death of her husband but was now having frequent visits with her primary care physician and children.

In this case, there are clearly other issues involved than her visual problems. It is important to first rule out ocular disease on exam such as cataracts, glaucoma, and ARMD; and then it is important to address other possible issues such as depression, dementia, or hearing loss. Comorbidities are important to be aware of and screen for in all patients but in particular the elderly.

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Refer Comorbidities

Sushma Yalamanchili

Case Vignette

A 67-year-old man has a 3-week history of new binocular diplopia. The diplopia became worse over the past week, but then stabilized. Currently his left eye “droop” has improved. In the first 2 weeks, he had also noticed severe retro-orbital pain on the left side but this pain has since become minimal. He has a history of cataract extraction in the left eye and stable vision. His past medical history is significant for hypertension and diabetes. He cannot remember the names of his medication or his most recent blood sugar level. He also smokes a pack of cigarettes a day. He denies any facial numbness, recent headache, jaw claudication, or other neurologic deficits.

Examination reveals a visual acuity of 20/25 on the right and 20/25 on the left. Pupils are 3 mm bilaterally and both react well to light and near. There is no relative afferent pupillary defect. Visual field testing and color plate naming were normal. He has complete ptosis of his left eyelid and markedly impaired levator function. He cannot adduct, elevate, or depress the left eye but he can fully abduct the eye. Attempts at depression of the left eye result in intact incyclodeviation of the eye. Motility is normal in the right eye. There is no proptosis, facial sensation is normal, and general neurologic exam is otherwise normal. Fundus exam reveals severe bilateral diabetic retinopathy without disc pathology and mild attenuation of the vessels.

Introduction

It is important to look at the patient as a whole and not just treat his ocular condition. This patient appears to have an isolated pupil-spared, third nerve palsy without associated neurologic findings. Risk factors such as diabetes,

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Fig. 1 The frail elderly especially those with predisposing risk factors may require referral to primary care for evaluation in order to prevent comorbidities such as falls or fractures

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heart disease, hypertension, and cholesterol as well as compressive lesions should be considered. This particular patient is known to have diabetes. Referring this particular patient to his primary care physician to check his hemoglobin A1C level and manage his diabetes and hypertension are important initial steps. Although the detailed management of third nerve palsy is beyond the scope of this chapter, we would like to emphasize the competency-based aspects of dealing with this multidisciplinary clinical problem. Hence, it is very important to address comorbidities (e.g., diabetes, heart disease, and hypertension) and refer these patients to the appropriate physicians for adequate care.

Practice-Based Learning

The severe ptosis and marked impairment of elevation, adduction, and depression in the right eye are compatible with a pupil-sparing, complete motor third nerve palsy. The sixth nerve and fourth nerve appear to be spared since the

patient still has full abduction and incyclodeviation on downgaze.¹ Isolated third nerve palsies with no pupillary involvement are most commonly caused by ischemia, especially diabetes mellitus. Diabetes is the most common etiology accounting for 46% of all cases with pupil sparing documented in 68–86% of the cases.² The most likely reason for pupillary sparing is the fact that in diabetic third nerve palsy there is lack of damage to the periphery of the nerve where the majority of pupillomotor fibers are thought to pass.³

In patients over the age of 55, giant cell arteritis must be ruled out. Ask about jaw or tongue claudication, fever, chills, myalgias, weight loss, lack of appetite, temporal headache, polymyalgia rheumatica symptoms, and scalp tenderness. If there is any degree of suspicion, an immediate sedimentation rate and C-reactive protein should be drawn, steroids started, and a temporal artery biopsy scheduled.⁴

Myasthenia gravis must also be ruled out in the elderly. Myasthenia may mimic a third nerve palsy where the patient has ptosis and diplopia. It is important to ask the following questions. Do you have any generalized muscle weakness, hoarseness, difficulty breathing or swallowing, any family history of myasthenia or thyroid disease? If one is suspicious for myasthenia because of fluctuating or fatiguing ptosis or ophthalmoplegia, a tensilon test should be considered and an acetylcholine receptor antibody and thyroid function tests could be ordered.⁵

Vacuopathic risk factors, especially diabetes mellitus, hypertension, and increased cholesterol, should be sought and controlled. Strabismus surgery or lid surgery may be helpful in selected patients with unresolved ophthalmoplegia, diplopia, or ptosis.

The patient should be followed at 1- to 2-month intervals to see if the third nerve palsy improves. Complete resolution for ischemic third nerve palsy is expected to occur in 3–6 months. If no improvement is evident by 3 months after onset, neuroimaging for a compressive lesion is typically recommended.⁶ Hence, all comorbidities need to be considered, referred, and ruled out by the appropriate physicians (e.g., primary care, cardiology, neurology, radiology, and neurosurgery).

Communication Skills

Despite having primary care physicians and knowing they have systemic diseases, sometimes patients are still noncompliant with medications and suggested treatment plans. The ophthalmologist who is worried about inadequately controlled blood sugar levels or high blood pressure should give the patient and family the opportunity for further evaluation and treatment options for their systemic diseases that may work. Contacting the primary care physician or cardiologist about their ocular condition and possible etiology being a systemic disease may alert them to seeking a better plan for their patient or stress compliance again with the patient.

System-Based Learning

When a patient has multiple medical problems as many elderly do, a treatment team is very important in order to treat comorbidities. Ophthalmologists and neurologists may work together to care for patients with third nerve palsy. In addition, physicians who manage diabetes, high blood pressure, or other underlying causative conditions will be involved in the patient's care.

An internist will do an initial workup of a pupil-sparing, third cranial nerve palsy without any other evidence of aneurysm for arteriosclerotic risk factors, including diabetes and hypertension. Certain patients may require screening for collagen vascular disease, systemic vasculitis, sarcoidosis, or other granulomatous systemic diseases. If carcinomatous meningitis is diagnosed on cerebrospinal fluid workup, then a search for systemic metastatic disease, an occult primary carcinoma, lymphoma, or leukemia is warranted.⁷

Neurosurgery or neurology needs to be consulted if a third cranial nerve palsy especially pupillary involving due to a berry aneurysm, with or without concomitant subarachnoid hemorrhage.⁸

The ophthalmologist provides symptomatic treatment for diplopia using occlusion. Special lenses with prisms may also improve diplopia. In addition, surgery on the eye muscles or eyelid may be necessary in some cases, although most clinicians recommend waiting 6 months from onset so that the patient's condition stabilizes.

Screening for and referring comorbidities is part of the role as an ophthalmologist. In this particular case, the following possibilities must be ruled out and/or referred to the appropriate physician if suspected.

Professionalism

Recognizing and being sensitive to the needs of an elderly patient with multiple medical problems is a must. Speaking with the family as well as the patient may improve compliance because the patient may be provided with more support to take medications on time, make doctor's appointments, and comply with dietary and lifestyle modifications.

Patient Care Summary

The patient above was diagnosed with an ischemic isolated third nerve palsy most likely from diabetes mellitus. The third nerve palsy was already improving at initial evaluation and subsequently did improve with simple observation over 3 months. Thus, no neuroimaging was performed. In the second month, he did patch the eye for symptomatic relief from the diplopia.

It is important to refer patients for comorbidities. In this case, the patient was sent to his primary care physician the day after the diagnosis was made. His blood sugar level was in the 300s. He was started on insulin for better management of his diabetes. He was also found to have elevated cholesterol and triglyceride levels and was started on appropriate medications and dietary modifications. The patient is much more compliant with medications at this time and checks his finger sticks daily. He states that he had quite a scare with the double vision and his retinopathy has also improved. It is very important to refer for possible or even known comorbidities. In this case, it was known that the patient had both diabetes and hypertension; yet, he was placed on a better treatment program after this incident. In addition, he decreased smoking, modified his diet, and started an exercise regimen. In conclusion, referring him to his primary care physician for better control of his diabetes and hypertension will aid him in having a better quality of life.

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Index

A

- Abdelhafiz, A. H., 85
- Abraham, A. G., 19, 21–23
- Acuity testing, 8
- Adelman, R. D., 98
- African-American population, glaucoma and blindness, 2
- Agency for Healthcare Research and Quality (AHRQ), 106
 - A-D studies, 106
 - supplement for ophthalmology, 107
- Age-related macular degeneration (AMD)
 - American Academy of Ophthalmology (AAO) recommendations for, 52–53
 - ANCHOR phase III trial, 54
 - antioxidant vitamins and zinc, 53
 - clinical signs
 - large drusen and retinal pigment epithelium abnormalities, 51
 - metamorphopsia and central scotoma, 51
 - severity score from AREDS, 52
 - smoking and, 51
 - cupric oxide use in, 53
 - dietary supplement formulation, 50–51
 - fluorescein angiography, 55–56
 - intravitreal anti-VEGF drugs
 - ranibizumab, 50
 - macula, evaluation of, 52
 - management, 49
 - near and distance activities, 50
 - neovascular AMD
 - management of, 53–54
 - in United States cases, 50
- Age-related vision loss
 - Age-Related Eye Disease Study (AREDS), 50–51
 - age-related median acuity in variable light conditions, 9
 - causes of, 2–3
 - combining vision and hearing loss, 8
 - depression and dementia, 111
 - functional impairment and
 - depression, 100
 - doctor role, 101, 103
 - eye disease/neurological involvement, 101
 - functional impairment and, 99
 - low-vision clinic, 103
 - rehabilitation, 101
 - self-sufficiency and, 100
 - strength and mobility, loss of, 100
 - vision-rehabilitation specialist and low-vision physician, 102, 104
 - visual assistance, 102
 - hypertension and diabetes, 111
 - interpersonal and communication skills, 3–4
 - medical costs and information, 3–4
 - medications, importance of, 3
 - multiple risk factors and physicians
 - reference for care, 115–116
 - dietary and lifestyle modifications, 118
 - ophthalmologist and neurologists, 118
 - primary care physician, 116
 - refer patients for comorbidities, 119
- primary care, 4
 - and quality of life, 55
 - aids for, 59–60
 - communication and linkages between providers, 61
 - macular degeneration and, 60
 - nonoptical low-vision aids use of, 62
 - primary care provider, 61

- Age-related vision loss (*cont.*)
 rehabilitation teacher, 62
 social worker and eldercare agency, 61
 screening for comorbidities
 care provider, 111
 case study, 109
 professionalism competency, 112
 routine preoperative evaluation, 110
 treatment of, 3–4
 Agnosia and agraphia, 73
 Aldridge, H., 119
 Alzheimer's disease and visual
 impairment, 72
 communication with primary care, 74
 field-of-view test, 75
 Goldmann perimetry testing, 74
 neuroimaging and, 74
 treatment for, 75
 visual-field testing in, 74
 Anderson, S. W., 76
 Anstey, K. J., 24
 Anterior chamber, slit-lamp evaluation, 28
 Appollonio, I., 66, 67
 Aquino, A. V., 119
 Aravanis, S. C., 96, 98
 Asbury, A. K., 119
 Asman, P., 119
 Austin, C. A., 87
 Avakian, A., 24
- B**
 Baker, R. S., 81
 Balamurugan, A., 5, 63
 Balint's syndrome, 73
 Baltimore Eye Study and uncorrected
 refractive error, 10
 Bandeen-Roche, K., 36
 Bassi, C. J., 76
 Bazargan, M., 81
 Bazargan, S. H., 81
 Beaver DamEye Study for hyperopia, 10
 Beaver, H., 7–12, 15–24, 27–35, 89–97
 Beaver, H. A., 15, 78
 Beck, J., 35
 Beck, J. C., 12
 Beers, M. H., 8, 12, 35
 Benson, D. F., 73
 Beta-carotene use for AMD, 53
 Bevacizumab randomized clinical trials for
 AMD, 55
 Bever, C. T. Jr., 119
 Bleasdale, S., 76
 Boerner, K., 67, 113
 Bondenson, J., 119
 Borchert, M., 76
 Bosley, T. M., 73
 Boulos, M. I., 76
 Bouras, C., 76
 Bowman, B. A., 47
 Brannan, S., 24
 Brazis, P. W., 74, 76, 119
 Breckman, R., 98
 Bressler, N. B., 51
 Bressler, N. M., 37–46, 49–57
 Bressler, S. B., 24, 47, 57
 Brody, B. L., 5, 60, 67, 103
 Broman, A. T., 13
 Brown, D. M., 57, 57
 Brown, G. C., 24
 Browning, C. J., 81
 Brown, M. M., 24
 Buckley, J. G., 85
- C**
 Campbell, A. J., 85
 Campbell, V. A., 12
 Carabellese, C., 69, 80
 Casten, R. J., 69
 Cataract
 surgery, case study
 cataract extraction, 22–23
 clinical studies, 19
 contrast sensitivity, 16
 corneal decompensation, 18
 corrected vision after, 23
 cortical opacities (CO) and, 21
 doctor and elderly patient
 relationship, 19
 elective surgical correction, 19–20
 financial costs, 22–23
 MMSE scores, 22
 patient care domain for, 15–16
 patient care parameters, 18
 patient's perception of and use of
 medical system, 20
 performance-based visual
 function, 19
 questionnaire (VFQ-25), 17
 risks and benefits, 20–21
 and vision loss in elderly
 population, 2
 Cavanagh, P. R., 87
 Central field deficit, visual deficits, 101
 See also Age-related vision loss

Central scotoma, 51
See also Age-related macular degeneration (AMD)
 Chang, D., 25
 Chang, T. S., 57
 Charkoudian, L. D., 57
 Charters, L., 98
 Chauban, B. C., 13, 36
 Chawluk, J., 76
 Chew, E. Y., 24
 Chiasson, L. A., 13, 36
 Choroidal neovascularization (CNV), 51
 optical coherence tomography (OCT), 54
 verteporfin, photodynamic therapy with, 54
See also Age-related macular degeneration (AMD)
 Clemons, T. E., 24
 Cloudy media, visual deficits, 101
See also Age-related vision loss
 Cogan, D. G., 119
 Coleman, A. L., 11, 87
 Collins, K. A., 98
 Comorbid eye disease, 21
 Condon, N. G., 25
 Congdon, N., 112
 Coons, D., 13
 Cotch, M. F., 13
 Creutzfeldt-Jacob Disease (CJD), 73–74
 Crews, J. E., 12
 Cruickshanks, K. J., 80

D

Daly, J. M., 25, 69
 Dandona, L., 113
 Dandona, R., 113
 Davis, R. J., 76
 Dawson, J., 76
 Dayhew, J., 85, 87
 De Boer, M. R., 84
 Dementia after visual loss, 71
 Depression after visual loss, 65
 care and decision making, 68
 communication competency, 68
 quality of life and mortality, 66
 screening test for, 67
 social relationships and, 66
 treatment, 67–68
 vision rehabilitation, 67
See also Age-related vision loss
 DeVita, E., 76
 Dewar, C., 24

Diabetic retinopathy
 communication with patients, 39
 diabetic macular edema, 38
 management of, 40–43, 46
 focal/grid photocoagulation, 46
 hemoglobin A1C concept, 39
 and management, 37
 indirect ophthalmoscopic examination of, 38
 OCT of fundus, 42
 panretinal photocoagulation (PRP), 45
 proliferative diabetic retinopathy
 management of, 43–45
 vision loss and, 38–39
 vitrectomy, 45

Diplopia
 case study, 115
 comorbidities prevention, 116
 Do, D. V., 47
 Dolan, C. M., 57
 Duc, M., 76
 Duffy, C. J., 76
 Dyschromatopsia, 73

E

Elder abuse, 89
 and care takers, 93
 Clinical Pathological Conference (CPC)
 report, 95–96
 communication skills, 94
 doctor-patient relationship, 97
 Elder Assessment Instrument (EAI), 92
 maltreatment, manifestations of, 92–93
 mistreatment with, 92
 normal pressure hydrocephalus (NPH)
 and, 90–91
 ocular trauma in, 90
 patient-care competency, 91, 93
 physical and occupational therapy, 90
 physical rehabilitation, 97
 practice-based learning and improvement, 95
 precautions for, 94
 professionalism competency, 95
 resources for, 96–97
 social and psychological problems, 96
 social worker role, 91
 Elliott, D. B., 87
 EndNote database, 106
 Endophthalmitis, 54
 Ewing, S. K., 87
 Extracapsular cataract surgery (ECCE), 19

Eye Diseases Prevalence Research Group for
low vision/blindness, 3

F

Falls in elderly and visual loss, 84
caregivers and social workers, role in, 86
counseling regarding risk factor
reduction, 86
fall-reduction techniques, 85
home-hazard reduction
recommendations, 86
home safety inspections and health
visit, 86
injury-related death and disability, 84
quality of life, 86
randomized controlled trial from New
Zealand, 85
risk factor for, 84
Farncis, B. A., 35
Faye, E. E., 101, 103
Fine, I. H., 24
Fine, J. T., 57
Fink, A., 12, 35
Fisher, C. M., 76, 119
Ford, E. S., 47
Foss, A. J. E., 25
Frattola, L., 69
Friedman, D. S., 83–86

G

Galaria, I. I., 67
Gamst, A. C., 69
Ganguli, M., 66
Garnst, A. C., 5, 63, 103
George, J., 76
Geriatric Depression Scale (GDS), 67
Gerstmann's syndrome, 73
Giannakopoulos, P., 76
Ginkgo biloba herb use for AMD, 53
Glaucoma in elderly, 27
case study
awareness and, 32
care with, 33
FDA approval for medication, 34
incidence and prevalence, with
advancing age, 38–39
intraocular pressure (IOP) and, 27
medical knowledge competencies
and, 30
medication in, 31
and motor vehicle accident (MVA), 30

one-eyed trial in right eye (OD) of
timolol GFS, 27
physician professionalism and, 33
primary open-angle glaucoma
(POAG) program, 29
prostaglandins, nighttime dosing
of, 35
public health screening programs, 29
quality of life and activities of daily
living, 28
race and age, 28–29
risk of drug toxicity, 31
slit-lamp evaluation of anterior
chamber, 28
treatment cost-effectiveness, 30
U.S. Preventive Services Task Force
(USPSTF), review of, 29
visual acuity OU, 27
visual-field testing, 28
worldwide ratio between open-angle
and angle-closure, 30–31

Glaucoma with topical medications, 4–5

Gohdes, D. H., 63
Gohdes, D. M., 5
Gold, G., 76
Goldstein, J. E., 119
Gower, E. W., 25, 57
Graff-Radford, N., 76
Gray, C. S., 21, 22, 24
Gregg, C. H., 70
Gutierrez, P. R., 24, 81, 113

H

Hafiz, G., 47
Harwood, R. H., 25
Haymes, S. A., 13, 30
Hearing and visual loss, 77
age-related macular degeneration
(ARMD) and, 78
aids for, 79
evaluation and treatment, 79
instrumental activities of daily living
(IADL) scales, 78
mortality rates, 78
professionalism competency, 79
Heasley, K. J., 87
Hegel, M. T., 69
Heier, J. S., 57
Heine, C., 81
Hemoglobin A1C concept, 39
See also Diabetic retinopathy
Hennessy, M. P., 24

Hersberg, R., 119
 Hier, D. B., 76
 Hildreth, A. J., 24
 Hill, R. D., 70
 Hoffman, R. S., 24
 Hof, P. R., 73, 76
 Holden, R., 35
 Homonymous hemianopsia, 73
 Hornick, T. R., 12, 25
 Horowitz, A., 67, 111
 Howland, A., 87

I

Intraocular lens power calculation, 16
 Intraretinal microvascular abnormalities
 (IRMA), 37–38

J

Jacobson, D. M., 119
 Jampol, L. M., 57
 Javitt, J. C., 63
 Jogerst, G., 25, 69

K

Kaiser, P. K., 57
 Kara-Jose, N., 24
 Karimova, G., 24
 Keane, J. R., 119
 Keeffe, J. E., 13
 Keeler, E., 13
 Keeler, E. B., 24
 Kennedy, G. J., 70
 Kiyosawa, M., 76
 Klaver, C. C., 112
 Klein, B. E., 13, 80
 Klein, B. E. K., 24
 Klein, R., 13, 80
 Kleinschmidt, J. J., 70
 Kleinschmidt, K. C., 96–97, 98
 Klesert, T. R., 57
 Knudtson, M. D., 24
 Kuper, H., 13

L

Lachs, E. S., 92–93, 98
 La Grow, S. J., 87
 Larsen, B., 63
 Larsen, B. A., 5
 Layde, P. M., 119

LeBlanc, R. P., 13, 36
 Lee, A. G., 25, 69, 71–75, 76, 77–80, 83–86,
 105–107
 Lee, J. M., 76
 Lee, P. P., 24
 Lehmkuhle, S., 76
 Levine, D. N., 76
 Levine, J. M., 98
 Lin, M. Y., 81, 113
 Long, C. A., 35
 Lord, S. R., 84, 85
 Luijm, S. M. F., 87
 Lutein antioxidant supplements for AMD, 53

M

Macular degeneration, 2
 Mangione, C. M., 13, 24
 Mariotti, S. P., 13
 Martin, C. O., 72, 76
 Mayer, R. S., 113
 Maylahn, C., 5, 63
 McCanna, T. D., 120
 McCarty, C. A., 13, 112
 McGwin, Jr. G., 13
 Mehta, J. S., 24
 Melbourne population-based
 study, 10
 Menz, H. B., 84
 Metmorphopsia, 51
See also Age-related macular
 degeneration (AMD)
 Michels, M., 57
 Moghimi, C., 113
 Mokdad, A. H., 47
 Moriarty, D. G., 12
 Morrison, J. H., 76
 Morris, P., 76
 Moss, S., 13
 Moss, S. E., 13
 Mulinger, L. M., 87
 Mulkerrin, E., 35
 Munoz, B., 13
 Myasthenia, 117
 Myopic patients, 8

N

Naeim, A., 21, 24
 National Eye Institute Visual Function
 Questionnaire (NEI-VFQ-25), 10–11
 National Health and Nutrition Examination
 Survey, 10

Nawrot, M., 76
 New vessels on optic disc (NVD), 45
 Ng, E. S., 36
 Nguyen, Q. D., 47
 Nicolela, M. T., 13, 36
 Night vision in diabetes mellitus and
 chronic open-angle glaucoma,
 case study, 1–2
 Noecker, R. J., 36
 Normal pressure hydrocephalus (NPH)
 and, 90–91
 See also Elder abuse
 Nuclear sclerosis (NSC) and smoking, 21

O

O'Colmain, B., 112
 Omega-3 fatty acids antioxidant
 supplements for AMD, 53
 Osborn, F., 25
 Owens, D. A., 87
 Owsley, C., 10

P

Packer, M., 24
 Papaliodid, G. N., 36
 Park, W. L., 113
 Pascolini, D., 13
 Pavel, D., 76
 Penn, A. S., 119
 Peripheral field deficit, visual deficits, 101
 See also Age-related vision loss
 Phillips, R. S., 24
 Pillemer, K., 98
 Pluym, S. F. M., 87
 Pokharel, G. P., 13
 Posterior subcapsular (PSC) cataracts, 21
 See also Cataract
 Presbyopia, 10
 Proliferative diabetic retinopathy (PDR), 44
 Prosopagnosia, 73
 Purdy, E. P., 94

Q

Quillen, D. A., 35

R

Ranibizumab randomized clinical trials for
 AMD, 55
 Rapuano, C. J., 36

Refractive error
 in geriatric population
 case study, 7
 patient-centered care, 8–9
 and vision loss, 9
 Rein, D. B., 13
 Reinhardt, J. P., 69, 113
 Research agenda-setting project (RASP),
 105–107
 Resnikoff, S., 13
 Rhee, D. J., 36
 Riaz, Y., 24
 Rizzo, M., 76
 Robertson, M. C., 87
 Roch-Levecq, A. C., 69
 Rodriquez, J., 13
 Rosenfeld, P. J., 57
 Ross, G. W., 76
 Rovner, B. W., 66, 69, 80–81
 Rozzini, R., 69
 Rubin, G. S., 36
 Rudd, A. G., 13
 Ruit, S., 25

S

Sadun, A. A., 76
 Salisbury Eye Evaluation study, 30
 Schachat, A. P., 57
 Schulmeister, L., 25
 Scilley, K., 13
 Second-eye surgery, 22
 Seddon, J. M., 24
 Sen, J., 19, 24
 Shah, S. M., 47
 Sharma, S., 24
 Shema, S. J., 81, 113
 Sherwin, J. C., 13
 Shilling, J., 13
 Shmuel-Dulitzki, Y., 69
 Simultagnosia, 73
 Singleton, S. J., 76
 Slakter, J. S., 5
 Small-incision extracapsular cataract
 surgery (SICS), 19
 See also Cataract
 Smit, J. H., 87
 Snyder, B. D., 76
 Solomon, S. D., 57
 Sommer, A., 13
 Sperduto, R. D., 13
 Srinivas, M., 113
 Startzwell, J. K., 87

Steinert, R. F., 24
Steinman, B. A., 76
Steinman, S. B., 76
Sterns, G., 1–5
Sterns, G. K., 59–62, 99–103
Stoll, M. R., 13
Stone, K., 87
Stone, K. L., 81, 113
Strawbridge, W. J., 81, 113
Sturgess, I., 13
Stur, M., 5
Sykes, D., 35

T

Tabin, G., 25
Tasman, W. S., 69
Taylor, H. R., 112
Temporini, E. R., 24
Tielsch, J. M., 13
Tolman, J., 70
Trabucchi, M., 69, 80
Trick, G. L., 74, 76
Trick, L. R., 74, 76
Trobe, J. D., 119
Tromp, A. M., 87
Twigg, P., 87

U

United Kingdom, uncorrected refractive errors study, 10
United States, elderly persons in, 1
Uveitis, 54

V

VanNewkirk, M. R., 112
Varma, R., 35
Vecera, S. P., 76
Victoroff, J., 76
Visual acuity
 aging process and, 9
 bilateral loss of, 9
 case study, 7

 loss in elderly, 8
 medical costs, 12
 quality of life (QOL) and activities of daily living (ADL), 8
 rehabilitation of elderly, 12
 treatment of, 11
 useful field of view (UFOV), 9
 WHO evaluation, 9–10

Vitale, S., 13
Vogt, B. A., 76
Vu, H. T. V., 9

W

Walker, J. G., 24
Wallhagen, M. I., 81, 113
Wang, Q., 13
Ward, H. M., 57
Warren, S., 76
Watson, G. R., 9, 13, 36
Weih, L., 112
Williams, R. A., 5, 103
Willke, R. J., 63
Wirth, K. E., 13
Witt, K., 13
Wolf, M., 76
Wormald, R., 24

X

Xeathanthin antioxidant supplements for AMD, 53

Y

Yalamanchili, S., 109–113
Ying-Lai, M., 35
Yu, F., 13

Z

Zakzanis, V. K., 76
Zhang, P., 13
Zhou, Z., 63
Zisselman, P. M., 69