All about Your Eyes

SECOND EDITION, REVISED AND UPDATED

SHARON FEKRAT, MD, **TANYA S. GLASER**, MD,
AND **HENRY L. FENG**, MD, EDITORS

"An essential, reasonably priced resource for junior-high, high school, and public libraries, nursing homes, and hospital reference shelves."
—BOOKLIST

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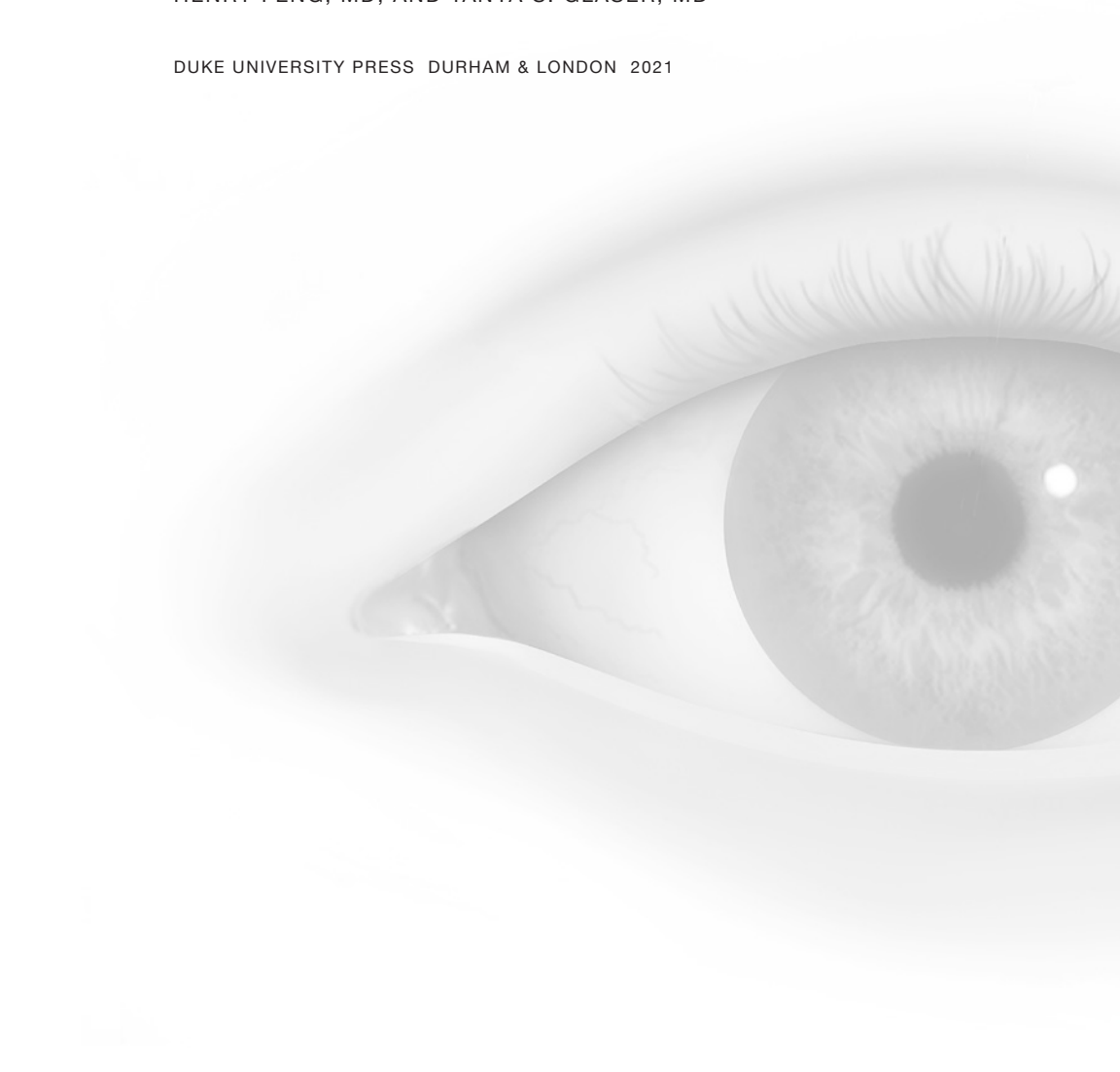

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Foreword

EDWARD BUCKLEY, MD

In today's rapidly changing healthcare environment, patients are being met with more challenges and choices than ever before when it comes to navigating their medical care. Ranging from a variety of insurance plans to complex treatment regimens, it is not surprising to learn that older patients often have the most difficulty understanding and utilizing the full range of healthcare services.

This is particularly important in terms of eye disease as the likelihood of developing visual impairment increases with age. Leading causes of decreased vision include cataract, glaucoma, macular degeneration, and diabetic retinopathy, all of which are more common and often more severe in older individuals. Fortunately, novel therapies continue to be developed for many of these sight-threatening conditions, allowing vision to be preserved for many more people. However, as the population grows, physicians are also met with increasing demands for care, resulting in pressures to see more patients and a reduction in the amount of available time for patient education and counseling.

Healthcare leaders continue to recognize the importance of patient-centered, integrative, and personalized medicine as an integral part of a successful healthcare experience. As such, patients are often met with various diagnostic and treatment decisions, many of which may be difficult to fully understand. Even with the burgeoning wealth of information on the Internet, it may be difficult for many to understand medical topics described on certain websites, and even more challenging to ensure that those sources are reputable and updated. Nonetheless, many of today's patients are excellent advocates for their own health and often demand detailed information when possible.

In order to meet the continually growing need for patient education, Drs. Sharon Fekrat, Henry Feng, and Tanya Glaser have organized and updated an important, detailed, yet readable handbook designed to help those who are interested in eye health better understand certain eye con-

ditions and participate in their own eye care. This second edition extends critical knowledge about eye disease from some of our country's best eye doctors to interested readers, and ultimately impacts not just patients, but also their family and friends.

The early chapters discuss basic eye anatomy, function, and refractive correction. The book then goes on to highlight some of the most important eye conditions as identified by the National Eye Institute and the World Health Organization. In most instances, the text is organized by specific disease, but it also expands upon novel medications, imaging tests, and surgical procedures to help demystify the most impactful eye conditions and available treatments.

All about Your Eyes is a remarkably detailed yet understandable resource that will surely empower patients and their family members with the knowledge needed to participate in their own eye care.

Introduction

SHARON FEKRAT, MD, FACS, HENRY FENG, MD,
AND TANYA S. GLASER, MD

It has been almost 15 years since the first edition of *All about Your Eyes* was published in 2006. Since that time, there have been many advances in the diagnosis and treatment of eye disease. To keep the readership up-to-date with the latest information, we thought that it was time for a second edition.

We have maintained the same general format but have added new sections on cutting-edge imaging modalities such as fundus autofluoresence and OCT angiography, and updated sections to include the latest treatment options, such as femtosecond laser during cataract surgery and retinal prostheses, just to name a few.

On behalf of all the eye doctors who have trained at or are currently working at the Duke Eye Center, we hope that you and your family and friends benefit from the information contained herein. Although reading about your eyes in this book can provide a useful understanding of the eyes and the various conditions that may affect them, this book is not designed to promote self-diagnosis or be a substitute for a visit to your eye doctor. Only after a thorough eye examination and any necessary testing can your eye doctor come up with an accurate diagnosis and treatment plan.

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1 · Anatomy of the Eye and How It Works

Eyelids

JAMES H. POWERS, MD

The eyelids serve two principal functions: protection and lubrication of the eye. The eyelids protect the eye by acting as a physical barrier that prevents both excessive light and foreign objects from damaging the eye, while eyelashes trap unwanted debris. The eyelid lubricates the eye by distributing the tear film evenly across the surface of the eye. Tiny glands in the eyelid add oil to the tear film to help prevent evaporation.

Anatomically, the eyelid is composed of an outer layer of skin, followed by a layer of muscle and supportive tissue, and finally the innermost conjunctiva. The muscular layer helps control the opening and closing of the eyelid. The conjunctiva of the eyelid is continuous with that of the eyeball. The eyelid can be affected by both acquired and congenital disorders, including infection, inflammation, neurologic disorders, anatomic abnormalities, and malignancy.

Conjunctiva

TANYA GLASER, MD

The conjunctiva is a thin mucous membrane that covers the white (sclera) of the eye and the inner surface of the upper and lower eyelids. The conjunctiva becomes thinner as it nears the cornea (the clear front circular surface of the eye) and terminates at the edge (limbus) of the cornea. The conjunctiva serves as the outer protective covering of the eyeball and provides a smooth surface that interfaces with the eyelids, making blinking and eye movements comfortable. Blood vessels in the conjunctiva help nourish the eye. Blood or inflammation in the conjunctiva, such as with subconjunctival hemorrhage or conjunctivitis, can cause it to appear red or pink.

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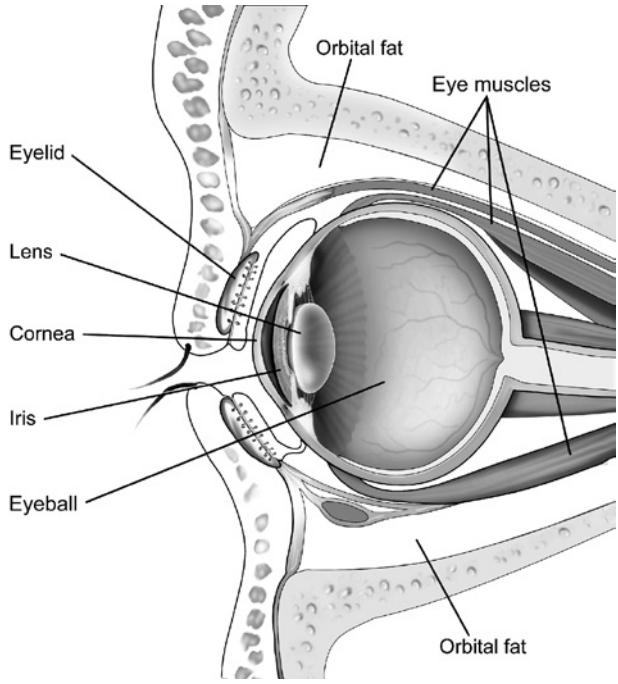
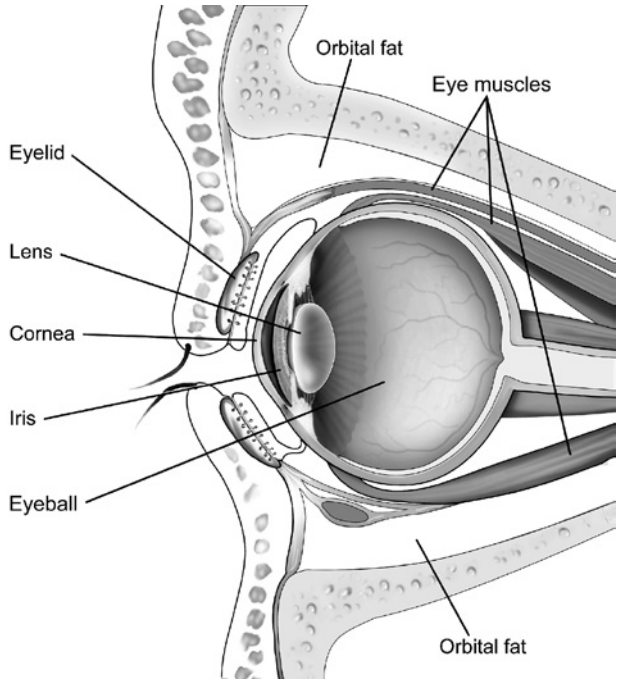


1.1. Side view of the eyeball behind the eyelids.

Sclera

NIKOLAS RAUFI, MD

The sclera is the outer tough, white connective tissue that forms the eye wall. It begins at the edge of the clear cornea, called the limbus, and extends backward toward the optic nerve. The "white part" of the eye is actually the sclera covered by a thin layer of tissue called conjunctiva. The sclera is made of collagen fibers, which provide strength and support, giving structure to the eyeball. In the back of the eye, the sclera provides attachments for the darkly pigmented choroid on its inner surface. It also serves as the attachment site for the six eye muscles. Contraction of these eye muscles pulls on the sclera and causes the eye to move. Like other parts of the eye, problems can occur in the sclera; scleritis and episcleritis are two examples of inflammatory scleral conditions.



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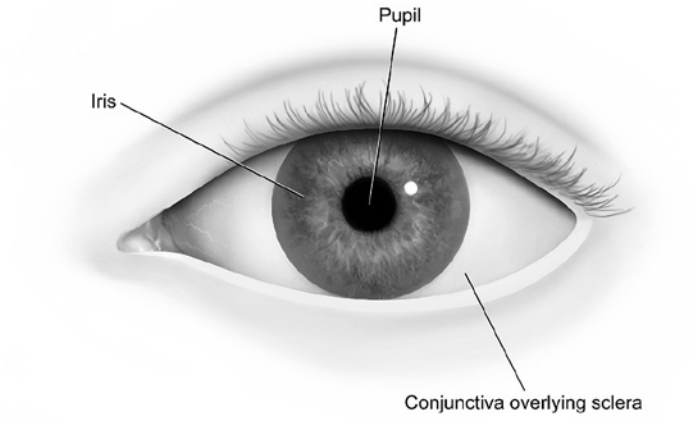


1.2. Front view of the eyeball.

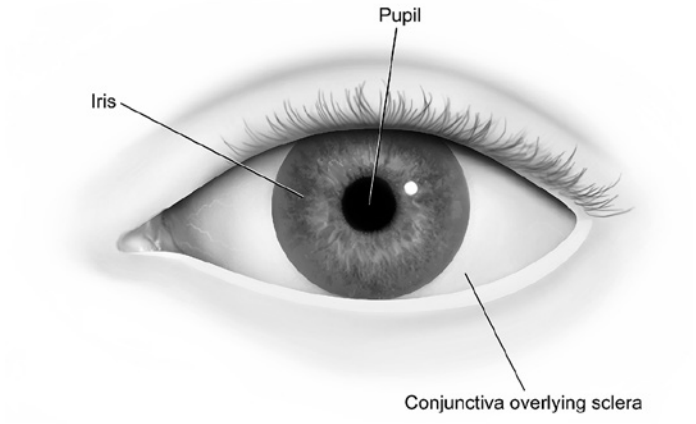
Cornea

C. ELLIS WISELY, MD, MBA

The cornea is the transparent, round, dome-shaped tissue on the front central surface of the eye and is the window through which light passes into the eye. A normal cornea has a diameter of 12 millimeters (mm) and a thickness of 0.5 mm. The cornea is made up of thin layers of proteins and cells stacked upon one another. The cornea's innermost layer, called the corneal endothelium, acts as a pump to remove water from the cornea, allowing the cornea to remain clear.

Unlike other parts of the eye, the cornea does not have a blood supply. Thus, to get oxygen and nutrients, the cornea absorbs substances circulating in the tears and in the aqueous humor (fluid inside the front part of the eye). The cornea is one of the most densely innervated tissues in the body, making it painful to touch or scratch.

Protecting the eye and focusing the light that enters the eye are two principal functions of the cornea. The cornea protects the eye by providing a physical barrier against pathogens such as bacteria, by harboring immune cells, and by sending pain signals in the event of injury. The dome-shaped curve of the cornea allows it to bend and focus light, a



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