

The ophthalmic assistant

Fundamentals and clinical practice

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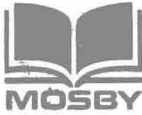
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Foreword

An ophthalmologist who does not work with an ophthalmic assistant is a person who does his own scheduling, answers his own phone, does surgery alone, and does not admit a patient to a hospital. I have not heard of such a person in years. We sometimes forget how many assistants we have and how vitally important they are to us and our patients. In this fourth edition of *The Ophthalmic Assistant* Harold Stein and Bernard Slatt have continued to demonstrate their superb ability to write in an easy to read style. Even more impressive is their knowledge and understanding of what a variety of ophthalmic assistants need to know in order to comfortably, capably, and appropriately perform their critical tasks as members of the ophthalmic team. Complete ophthalmologic care can best be provided when all team members are secure in their knowledge of ocular problems and clear in their role and responsibility.

The desire of the authors to ensure that ophthalmic assistants—running the gamut from the floor and operating room nurse, to the more traditional model of the ophthalmic assistant, to the office receptionist—have a fundamental back-

ground in disease processes is achieved herein. This text contains basic information on everything from testing vision to certain surgical procedures, with an emphasis on technical considerations throughout.

This text is of value to all those associated with ophthalmologists—from front office (billing personnel) to the “detail” person in the pharmaceutical and instrumentation industries. Most of all, the assistant who day-to-day works with the ophthalmologist to assist in providing patient care will gain—as will our patients—by reading, discussing with the ophthalmologist, and incorporating the valuable information in this text into their invaluable role in the best of patient care.

Previous editions of *The Ophthalmic Assistant* have been used as the standard text by ophthalmic assistants the world over and this enhanced edition will be the new standard.

Bruce E. Spivey, M.D.

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Preface to fourth edition

This book has been written expressly for ancillary ophthalmic workers who assist the ophthalmologist in the day-to-day care of eye patients. Many ophthalmic assistants and technicians have had no opportunity for formal training and have learned their duties on the job. Under such circumstances much of the knowledge of terminology and method is learned by rote, and often with little understanding of the subject. Experience alone may become a highly repetitious teacher. To paraphrase Sir William Osler, experience without knowledge is to sail an uncharted course, but knowledge without experience is never to go to sea at all. This book is designed to help fill the vacuum in our ophthalmic community by providing a training basis for ancillary personnel and meeting the needs for a reference source. We have purposely avoided controversial subjects and highly specialized technical areas because of the varying degrees of training of ophthalmic assistants. Rather, the emphasis has been placed on illustrations and photographs to illuminate and clarify ophthalmic technology and to foster interest wherever possible.

The role of the ophthalmic assistant is to provide reliable and competent eye care prior to and following regular visits to offices, clinics, and hospitals. The ophthalmic assistant must be familiar with procedures regarding sterility, the nature of emergency patients, and the technical aspects of ophthalmology. With this knowledge the ophthalmic assistant can increase efficiency, maintain better supervision of ocular instruments and trays, and ensure that all details of diagnostic workup and regimen are understood and carried out by the patient. Although emphasis is on the paramedical

functions of the ophthalmic assistant and not the secretarial aspects, we recognize that in a small office both positions may have to be carried out by the same individual.

In this fourth edition we have attempted to keep pace with the ever-expanding new developments in the field of ophthalmology. New chapters have been introduced, old chapters updated, and some sections entirely eliminated. We have tried to keep to the original concept: to provide a concise up-to-date review of the field of ophthalmology that is readable, interesting, and illustrated. New sections of questions for self-evaluation have been added to each chapter to provide the reader with not only a review but often new material not contained in the text.

Over the years we have broadened the scope of the textbook to provide not only practical technical information but also background information on ophthalmic disease processes and surgical procedures. We have added sections for the hospital ophthalmic assistant who aids in the operating room and for the nurse who aids in the postoperative care of surgical patients. We have added material of interest to those individuals working for optical and associated pharmaceutical companies. We have added material for contact lens technicians, with a more detailed review to be found in our companion book, *Fitting Guide for Hard and Soft Contact Lenses*, published by The C.V. Mosby Company. A companion book, *Manual of Ophthalmic Terminology*, published by The C.V. Mosby Company, serves to expand the limited glossary as a vocabulary builder.

While the main thrust of this book is toward the ophthalmic assistant, we hope the clarity,

organization, and readability of the book attract others in the ophthalmic community to the text.

We are delighted with the superb chapter on ophthalmic photography, contributed to the fourth edition by Mr. Czaba Martonyi, Photographer at the University of Michigan, Ann Arbor, and Chairman, Board of Certification of Ophthalmic Photographers. The fourth edition has been expanded by new chapters on ocular disease highlighted by a color atlas. We are grateful to Allergan Pharmaceuticals, Inc., and Syntex Ophthalmics, Inc., for providing financial assistance for the cost of color reproductions in the fourth edition, and to Dr. Ira Abrahamson, Jr., for furnishing us with several color slides for this section.

As in past editions we are also indebted to loyal friends: Mr. Norman Deer, who has been responsible for the artwork, and Mr. D'Arcy Kingsmill

of Imperial Optical for his critique of some of the sections. We are also indebted to our colleagues, Drs. Barnet Sakler, Les Landecker, Bud Appleton, Albert Cheskes, and Bernice Mandelcorn, Mrs. Dorothy Hartman, Mr. Tony Benson, and Mr. Keith Harrison, all of whom have given generously of their help in reviewing some of the sections for this edition.

We would like to express our thanks to Raymond Stein (son of H.S.) who has helped by gathering material and updating portions of this edition.

Individuals who have helped with previous editions are listed alphabetically in the acknowledgments.

**Harold A. Stein
Bernard J. Slatt**

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1 Disorders of conjunctiva and sclera and Disorders of the iris

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4 Disorder of the eyelid, Disorders of tear apparatus, and Common retinal disorders

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6 Common retinal disorders

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8 Miscellaneous eye disorders

part one

Basic sciences

chapter 1 *Anatomy of the eye*

- *Surface anatomy*
 - *Tear film*
 - *Cornea*
 - *Sclera*
 - *Uvea*
 - *Angle structures*
 - *Lens*
 - *Vitreous*
 - *Retina*
 - *Optic nerve*
 - *Visual pathway*
 - *Ocular muscles*
-

Although the eye is commonly referred to as the *globe*, it is not really a true sphere. It is composed of two spheres with different radii, one set into the other (Figs. 1-1 and 1-2). The front, or anterior, sphere is the smaller and more curved of the two and is called the *cornea*. The cornea is the window of the eye since it is a completely transparent structure. It is the more curved of the two spheres and sets into the other as a watch glass sets into the frame of a watch. The posterior sphere is a white opaque fibrous shell and is called the *sclera*. The cornea and the sclera are relatively nondistensible structures that encase the eye and form a protective covering for all the delicate structures within.

In terms of size the eye measures approximately

24 mm in all its main diameters in the normal adult.

Surface anatomy

The eye itself is covered externally by the eyelids, which are movable folds protecting the eye from injury and excessive light. The lids serve to swab the eye and spread a film of tears over the cornea, thereby preventing evaporation from the surface of the eye. The upper eyelid extends to the eyebrow, which separates it from the forehead, whereas the lower eyelid usually passes without any line of demarcation into the skin of the cheek. The upper lid is the more mobile of the two, and when the lid is open it covers about 1 mm of the cornea. A muscle that elevates the lid, the *levator*

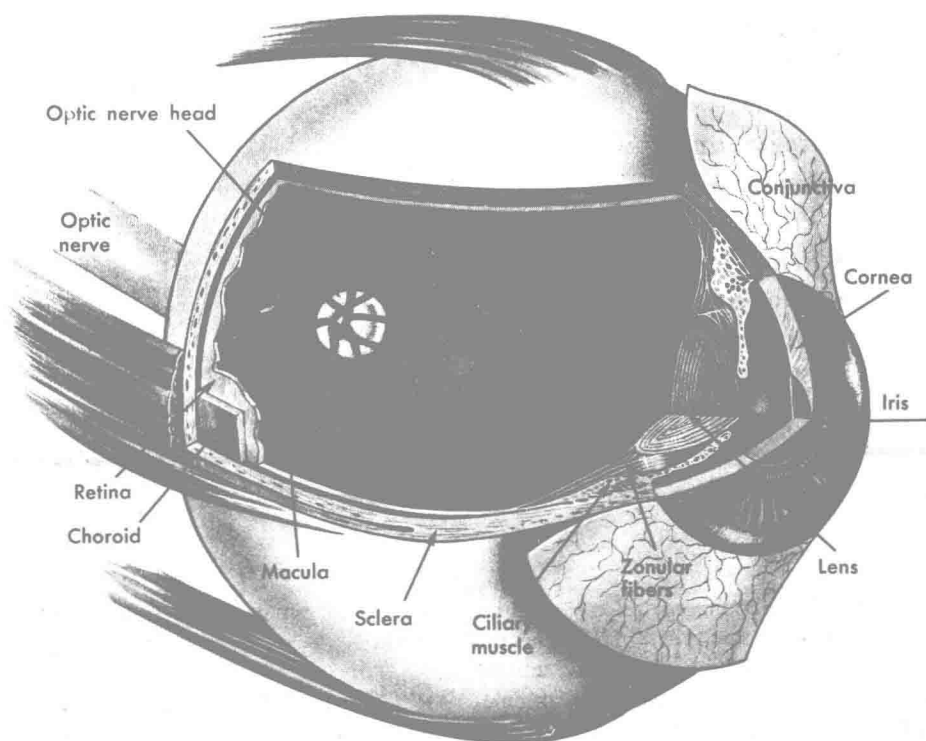


Fig. 1-1. Cutaway section of the eye.

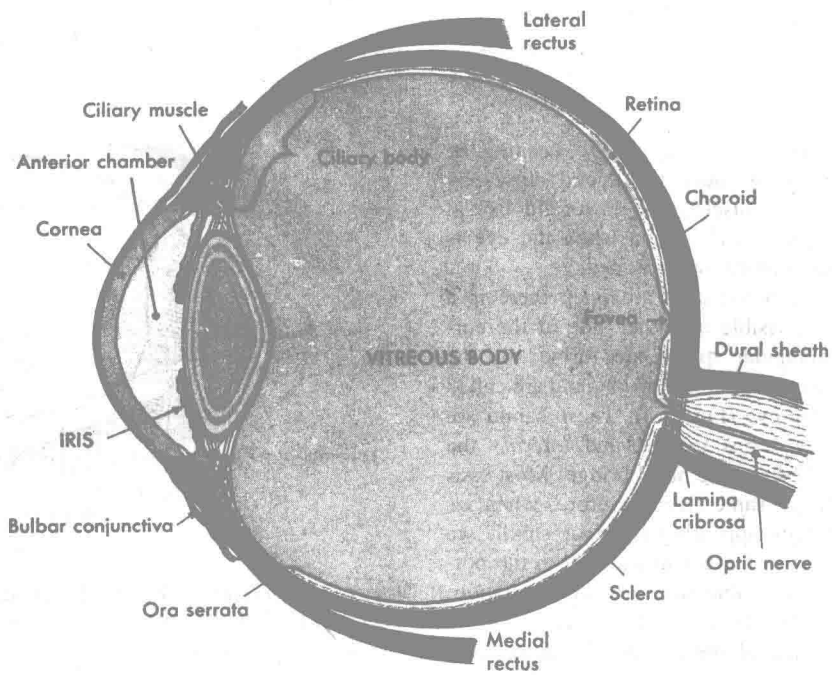


Fig. 1-2. The eye cut in horizontal section.

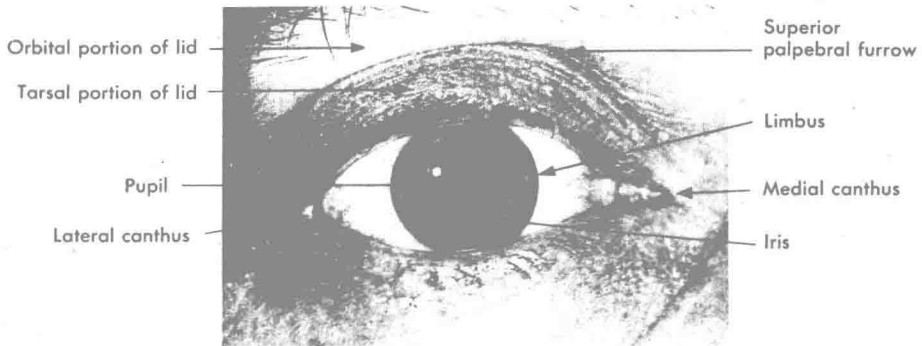


Fig. 1-3. Surface anatomy of the eye.

palpebrae superioris, is always active, keeping the eyelid open. During sleep the eyelid closes by relaxation of this muscle. The lower lid lies at the lower border of the cornea when the eye is open, and rises slightly when it shuts.

Normally, when the eyes are open there is a triangular space visible on either side of the cornea. These triangular spaces are formed by the junction of the upper and lower lids, and are called the *canthi* of the eye (Fig. 1-3). These canthi are denoted by the terms *medial* and *lateral*, the former being closer to the nasal bridge. Most eyes are practically the same size; therefore, when we speak of the eyes appearing large or small, we usually refer not to the actual size but to the portion of the eyeball visible on external examination, which in turn depends on the size of the palpebral fissure. The shape of the fissure also determines its appearance. In the case of the Oriental, there is a fold of skin extending from the upper lid to the lower lid and covering the medial fissure, giving the eye its characteristic obliquity. In the medial fissure there are two fleshy mounds: the deeper one, called the *plica semilunaris*, and the superficial one, called the *caruncle* (Fig. 1-4). The caruncle is modified skin containing sweat and oil glands. Occasionally it also contains fine cilia, or hairs. When the eyes are open the palpebral fissures measure about 30 mm in width and 15 mm in height.

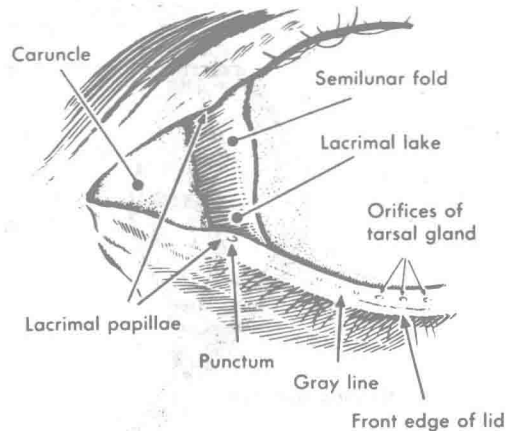


Fig. 1-4. Inner canthus, showing the semilunar fold and the caruncle. Normally the punctum is not visible unless the lower lid is depressed.

The free margin of each lid is about 2 mm broad and has an anterior and a posterior border. From the anterior, or front, border are the eyelashes, which are hairs arranged in two or three rows. The upper eyelid lashes are longer and more numerous than the lower, and they tend to curl upward. The lashes are longest and most curled in childhood. The posterior border of the lid margin is sharp and tightly abuts against the front surface of the globe.

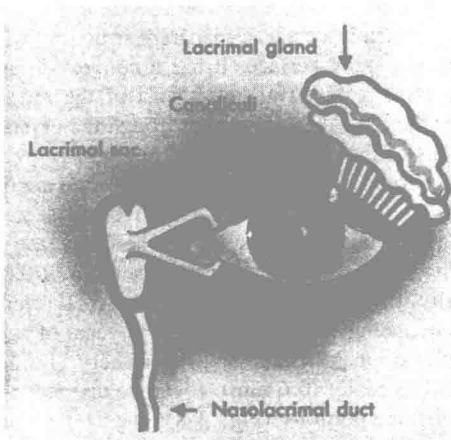


Fig. 1-5. Lacrimal apparatus. Tear produced by the lacrimal gland are drained through the punctum, lacrimal sac, and nasolacrimal duct into the nose.

By depressing the lower lid, one can see a thin gray line that separates the two borders of the lid. This line, called the *gray line*, is used in many surgical procedures to split the upper and lower lids into two portions. Also visible on both lids are the tiny openings that are the orifices of the sweat- and oil-secreting glands. The largest oil-secreting glands are embedded in the posterior connective tissue substance of the lids (called the *tarsus*), and are called the *meibomian glands*. On the medial aspect of the lower lid where the lashes cease is a small *papilla*. At the apex of this papilla is a tiny opening called the *punctum* (see Fig. 1-4). The punctum leads, by means of a small canal, through the lower lid to the *lacrimal sac* (Fig. 1-5), which eventually drains into the nose. Tears are carried to the punctum by the pumping action of the lids, and there they are drained effectively from the eye by means of tiny channels draining the punctum. A similar but smaller opening is found in the upper lid almost directly above it. The punctum normally cannot be seen by looking directly at the eye. It can be seen only by depressing the lower lid or everting the upper lid. The muscle underlying the eyelid skin is the *orbicularis*

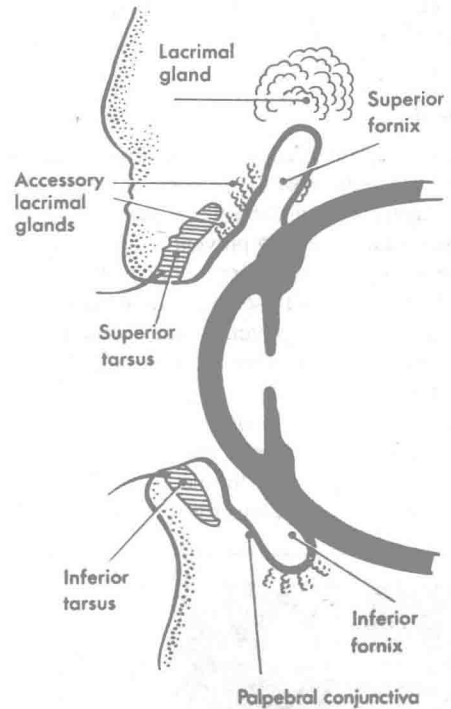


Fig. 1-6. Vertical section of the eyelids and conjunctiva. The lids act as a protective curtain for the eye. Only a small portion of the eye is actually exposed.

oculi, which is roughly circular. When it contracts it closes the eye.

The portions of the eye that are normally visible in the palpebral fissures are the cornea and sclera. Because the cornea is transparent, what is seen on looking at the cornea is the underlying *iris* and the black opening in the center of the iris, called the *pupil*. The sclera forms the white of the eye and is covered by a filmy, moist membrane called the *conjunctiva*. The conjunctiva extends from the junction of the cornea and sclera and terminates at the inner portion of the lid margin (Fig. 1-6). The conjunctiva that covers the eye itself is referred to as the *bulbar conjunctiva*, whereas the portion that lines the inner surface of the upper and lower lids is called the *palpebral portion*. The *junctional bay* created when the two portions of the

conjunctiva meet is referred to as the *fornix*. The lower fornix can easily be viewed by depressing the lower lid.

Tear film

The tear film is composed of three layers (Fig. 1-7). The outermost layer consists of a lipid or fatty layer, mostly cholesterol esters, and is extremely thin. It acts to prevent evaporation of the underlying aqueous layer. The central layer is chiefly aqueous, with some dissolved salts as well as glucose, urea, proteins, and lysozyme. The third layer is a very thin mucous layer lying just over the surface of the cornea. This layer is important in the stability of the tear film. Tear film abnormalities may arise in association with a number of clinical problems in the aged and particular problems related to contact lenses.

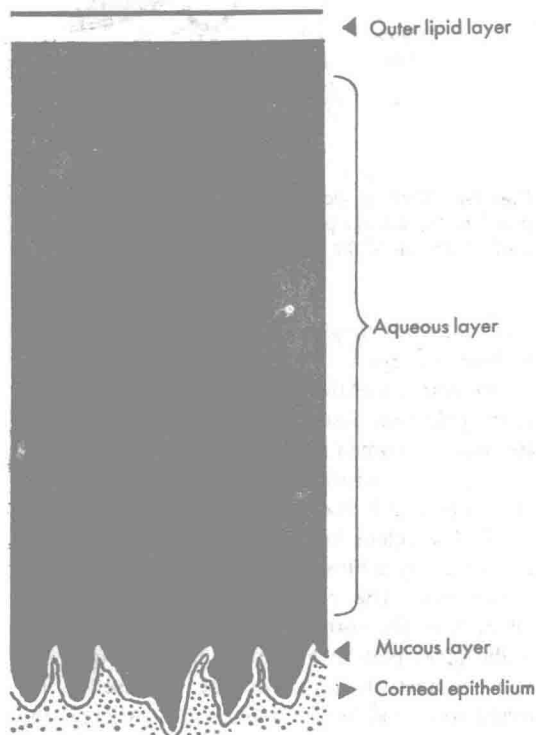


Fig. 1-7. Three-layer structure of the tear film.

Cornea

The cornea is a clear, transparent structure, with a brilliant, shiny surface. It has a convex surface that acts as a powerful lens. Most of the refraction of the eye takes place not through the crystalline lens of the eye but through the cornea.

The cornea is relatively large at birth and almost attains its adult size during the first and second years. Although the eyeball as a whole increases a little less than three times in volume from birth to maturity, the corneal segment plays a small role in this part, being fully developed by 2 years of age.

The cornea is thicker at its periphery (1 mm) than at the center (0.6 mm). It can be divided into five distinct portions (Fig. 1-8): the epithelium, Bowman's membrane, the stroma, Descemet's membrane, and the endothelium.

The epithelium, which is the part of the cornea usually injured with superficial abrasions or small foreign bodies, regenerates rapidly and heals without leaving a scar. Injury to the deeper structures nearly always results in formation of an opacity in the cornea. The cornea contains no blood vessels, as it is completely nourished by a plexus of fine capillaries surrounding it. The junction of the

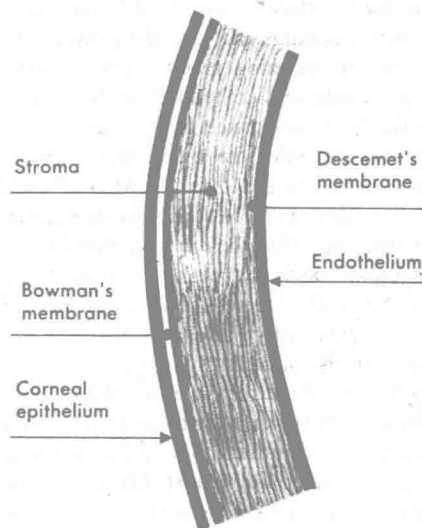


Fig. 1-8. Vertical section of the cornea showing its five layers.