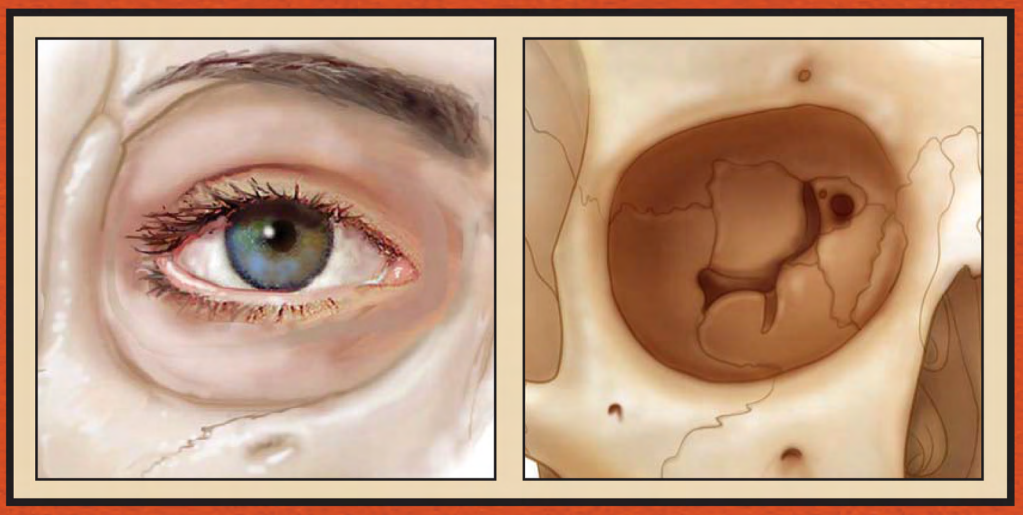
Eyelid & Periorbital Surgery

SECOND EDITION



Edited by

Mark A. Codner • Clinton D. McCord, Jr.

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Eyelid & Periorbital Surgery

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Second Edition

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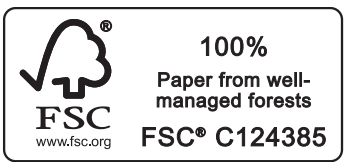

Twenty years of experience working in oculoplastic surgery has been my most rewarding professional accomplishment; it has allowed me to comfortably and confidently serve patients whom I would have otherwise not been able to help. I would like to dedicate this book to those patients, both the grateful ones who make your day, and the difficult ones I refuse to give up on. I am empathetic to the fact that they have to live with the problem every day. I also dedicate this book to **Sonny McCord,** who made my gratifying and unique practice opportunity possible. Sonny not only trained me, but has been like a second father to me, with unconditional support, advice, and encouragement. I also dedicate this book to my wife, **Jane,** and our beautiful and bright children, **Molly** and **Blake,** for your sacrifice during the hundreds of hours I could have and perhaps should have been with you instead of writing. I owe you credit for the greatest personal and professional accomplishment of my career.

M.A.C.

This second edition is dedicated to my wonderful wife, **Cissy McCord,** who over 43 years loved and supported me, and who passed away last year. Without her, I would have never been in a position to produce the academic and professional achievements that I may have contributed to my profession. I also want to pay tribute to **Mark Codner,** co-editor and author of this book, for his support to me and Cissy during her passing, and to his efforts involved with this second edition.

C.D.M.

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Preface

The opportunity to write and edit the second edition of *Eyelid & Periorbital Surgery* with Dr. Clinton Duncan "Sonny" McCord represents the culmination of decades of collaboration between plastic surgeons and oculoplastic surgeons. This has resulted in a synergetic net sum gain of knowledge dating back to the pioneers in this highly specialized and challenging surgical field. The giants on whose shoulders we stand in oculoplastic surgery are Dr. Byron Capleese Smith and Dr. Ramón Castroviejo Briones, among others, from whom Dr. McCord received direct surgical training during his fellowship in New York City. The giants in plastic surgery who influenced me and Dr. McCord include Dr. Herbert Conway and Dr. John Marquis Converse, whose legacy I experienced during my training in New York City, and Dr. Maurice John Jurkiewicz, who was Chairman of Plastic Surgery at Emory University during my plastic surgery residency in Atlanta. Oculoplastic surgery was met with great interest, and I was fortunate to receive fellowship experience with Dr. McCord before we practiced together for more than 20 years.

This book is a direct outgrowth of our combined passion and mutual respect for oculoplastic and plastic surgery, representing nearly 70 years of combined experience in both cosmetic and reconstructive surgery of the eyelids and periorbital area. In this second edition, published in the age of digital technology, we have created not only a new hard-cover two-volume textbook with 13 new chapters and 30 new videos, but also the entire text in an e-book format with an online video library. We hope our amalgamation of the principles of oculoplastic surgery and plastic surgery will be helpful to surgeons, ranging from those in training to those with significant experience who want to advance and enhance their surgical skills. What is more important, we hope patients will benefit from the principles we present of examination, diagnosis, surgical techniques, and nonsurgical treatments that have been refined through our experience.

In our practice of oculoplastic surgery, we have encountered some of the most challenging and rare conditions, both congenital and acquired, reconstructive and cosmetic, and unfortunately many as a result of previous complications. The approaches and techniques described here in systematic fashion, and demonstrated with more than 2900 case photographs and the highest quality medical illustrations available, will assist readers in performing a wide range of routine primary procedures while minimizing the risk of complications. Readers will also learn management of complicated reoperative cases and correction of complications to help patients who have often had an unexpected and very difficult postoperative course. We have focused on the foundation principles and techniques that are safe, reliable, and, of paramount importance, reproducible. These techniques have evolved as a result of our own challenges and sometimes trying learning experiences of what *does not* work. We have

provided readers with the tried and true procedures that *do* work to enable them to tackle and correct some of the more difficult problems.

The second edition is logically organized into two volumes and five parts. Part I, *Fundamentals,* includes classical eyelid and periorbital surgical anatomy, new concepts in eyelid function based on morphologic biometrics and innervation, and basic principles of useful grafts and flaps in the periorbital area.

Part II, *Aesthetic Surgery,* begins with a description of the theoretical changes that occur with aging as well as the anatomic changes; then a number of essential chapters instruct readers on anatomically based surgical technique, covering comprehensive alternatives in aesthetic surgery of the forehead and brow; upper and lower lids; the midface including malar bags and festoons; male blepharoplasty; Asian blepharoplasty; and several chapters on correction of complications, which is a large referral part of any busy oculoplastic surgeon. Detailed principles of spacer grafts for ectropion correction as well as new concepts in lateral canthal iatrogenic dysfunction and management are described.

Part III, *Aesthetic Nonsurgical Periorbital Treatments,* presents balanced and conservative but effective approaches to safe periorbital rejuvenation with nonsurgical skin care and energy-based treatments that yield clear results and a high patient satisfaction rate. These include injection of fillers to the periorbital area, midface, and tear trough; botulinum toxin; and the pros and cons of periorbital fat grafting.

Part IV, *Reconstructive Surgery,* includes extensive coverage of ptosis repair; an exhaustive list of malignant eyelid tumors and the most up-to-date treatment recommendations for these, particularly for melanoma of the eyelid; and a systematic, anatomically based approach to Mohs surgical resection of eyelid tumors based on the depth and location of the defect. The lacrimal drainage system is extensively covered, as is comprehensive management of eyelid trauma for patients in the emergency department. The more common cases in elective practice are also reviewed in detail, such as involutional and cicatricial entropion and ectropion, protection of the cornea and globe in the presence of facial nerve palsy, conservative management of eyelid changes in patients with Graves' disease, and common pediatric eyelid anomalies that can be managed by the oculoplastic surgeon.

Part V introduces basic cases in *Orbital and Lacrimal Surgery* that can be managed by an experienced plastic surgeon or may be referred to a surgeon with an ophthalmologic background. The chapters in this section include management of orbital blowout fractures, of acute orbital trauma, and of globe injury or chronic pain requiring evisceration or enucleation, including the steps required to create a natural appearing artificial eye.

To enhance the total educational experience before the reader performs surgery, we have included 76 videos that range from fully edited, narrated cases to focusing in detail on the critical key steps of a procedure to provide a refresher before surgery. The video library has a separate table of contents, and the videos are indicated with icons throughout the book at the appropriate topic location.

It is our hope that this second edition of *Eyelid & Periorbital Surgery* will stimulate and motivate surgeons to expand their practices to include the eyelids and periorbital areas to their repertoire, increase their comfort zone with specific procedures, and improve their ability to help a broader range of patients with confidence. Eyelid and periorbital surgery should always combine the principles of ophthalmology and those of plastic surgery, based firmly on the groundwork of the pioneers of this specialty, to whom we will always owe a debt of gratitude.

Mark Codner
Sonny McCord

Acknowledgments

Unlike many textbooks with different authors for every chapter, Dr. McCord and I have written almost every chapter in this book, reviewed every word, case, medical illustration, and reference to be sure you receive accurate and up-to-date information. As always, errata are inevitable, although all involved in the process have worked hard to keep these to a minimum. Please contact the publisher with any suggestions for corrections.

We did not labor alone and would like to acknowledge and thank our colleagues and friends for their contributions: Video Editor Johnson C. Lee, MD, my previous Fellow, for his attention to detail in editing over 30 new videos; William Pai-Dei Chen, MD, Dr. McCord's previous Fellow, who contributed the chapter on Asian blepharoplasty and has three of his own books on the topic; Lisa M. DiFrancesco, MD, my previous Fellow, who contributed the chapter on fat grafting and complications; Brian M. Derby, MD, my previous Fellow, who reviewed and edited every illustration from the first edition and contributed to the chapter on correction of complications of lower lid surgery; and Tomasz R. Kosowski, MD, my previous Fellow, who contributed to the chapters on aesthetic nonsurgical periorbital treatments, along with our nurses, Rena L. McConville, LPN, Julie B. Krochonis, RN, BSN, and Dr. McCord's previous nurse, Mary E. Popp, RN, BSN, CNOR. I would like to thank my Practice Administrator, Helen Daniell, who assisted with obtaining excellent patient photographs and aided in all the work that goes on behind the scenes to make such a project possible.

Finally, thank you to Executive Editor Sue Hodgson of Taylor & Francis Publishing for her positive encouragement in creating this new edition; she is a pleasure to collaborate with. Thanks to the entire publishing staff, who have worked tireless hours on the editing, processing, layouts, illustrations, and videos, including Amanda Behr, Brenda Bunch, Megan Fennell, Martin Mellor, Suzanne Wakefield, Idelle Winer, Carolyn Reich, Brett Stone, Linda Maulin, and many more. A special thanks to the medical illustration department for making significant improvements and corrections to the first edition's drawings and for many excellent new drawings for the second edition. We would also like to thank our friend and colleague of more than 20 years, Bill Winn, who has illustrated more for us than any other illustrator. He possesses a master talent and medical artistic genius, with an eye like a plastic surgeon for attention to detail.

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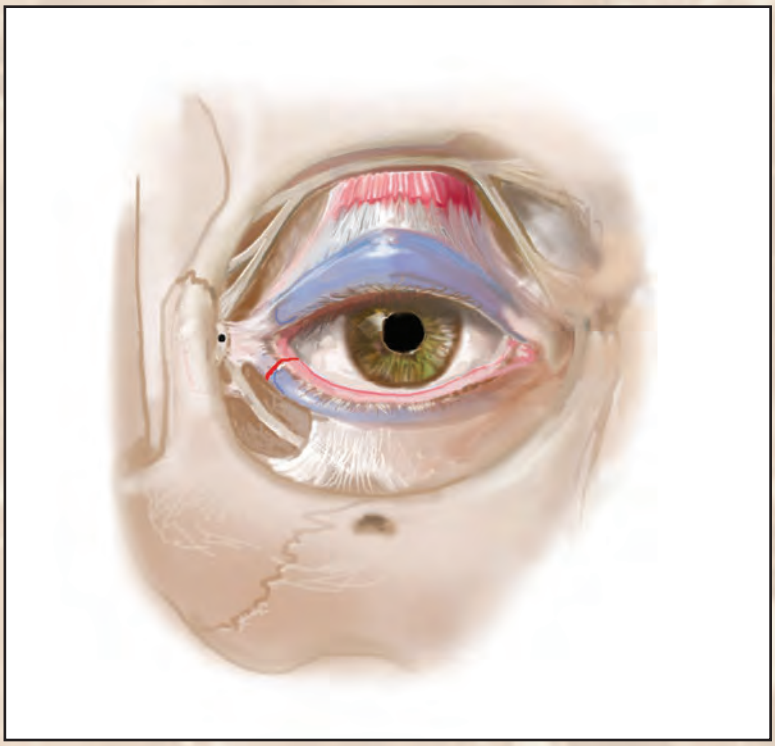
PART I

Fundamentals



Chapter 1

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Periorbital and Eyelid Anatomy

Key Points

- Changes in surface anatomy that occur with aging should be appreciated to restore the eyelids to a natural and more youthful appearance.
- The upper lid, the eyebrow, and the forehead should be considered as one aesthetic unit, and all of these areas should be specifically examined before surgery.
- The lower lid, the cheek, and the midface should also be considered as separate aesthetic units. Surgical procedures should be considered on the basis of desired changes in these areas.
- The periorbital region contains several anatomic components that range from the bony orbital skeleton to the surface anatomy, including the support structures of the eyelids, the lacrimal system, and the eye. A fundamental understanding of the anatomy of these components is essential to maintain the protection of the eye.
- The support structures of the eyelids are divided into the anterior and posterior lamellae.
- The fundamental eyelid fissure shape is created by the tarsoligamentous sling of the lower lid and the upper eyelid margin position.
- The dynamic features of the eyelids arise from the periorbital muscles, including the levator palpebrae superioris, Müller's muscle, the glabellar muscles, and the orbicularis oculi.
- An important anatomic consideration for the aesthetic improvement of the periorbital region includes the removal and redistribution of the fat compartments.
- Knowledge of blood supply and lymphatic drainage are important for the resection and reconstruction of the eyelids during the management of malignant lid neoplasms.

The key to surgery of the eyelids and the periorbital area is a thorough knowledge of the anatomy of this complex region. Surgical rearrangement of the anatomy of the eyelids influences their form, function, and appearance. The surgeon must understand the areas of surgical correction as well as the areas that may be secondarily affected by surgical manipulation or complications. The surgical techniques described in this text require a solid grounding in the anatomy of this area to ensure that all procedures are performed safely and with optimal results.

SURFACE ANATOMY

The surface anatomy or topography of the eyelid-periorbital region includes the brow, the forehead, the upper eyelid, the lower eyelid, and the midface (Fig. 1-1). The terminology of this region is important, particularly when referring to existing skin or planned skin changes related to aesthetic eyelid surgery. The layers of the eyelid are divided into the anterior and posterior lamellae. The anterior lamella includes the skin and the orbicularis. The posterior lamella includes the tarsoligamentous sling and the conjunctiva as well as the capsulopalpebral fascia (CPF) of the lower lid. The septum separates the anterior and posterior lamellae and is often referred to as the *middle lamella*.

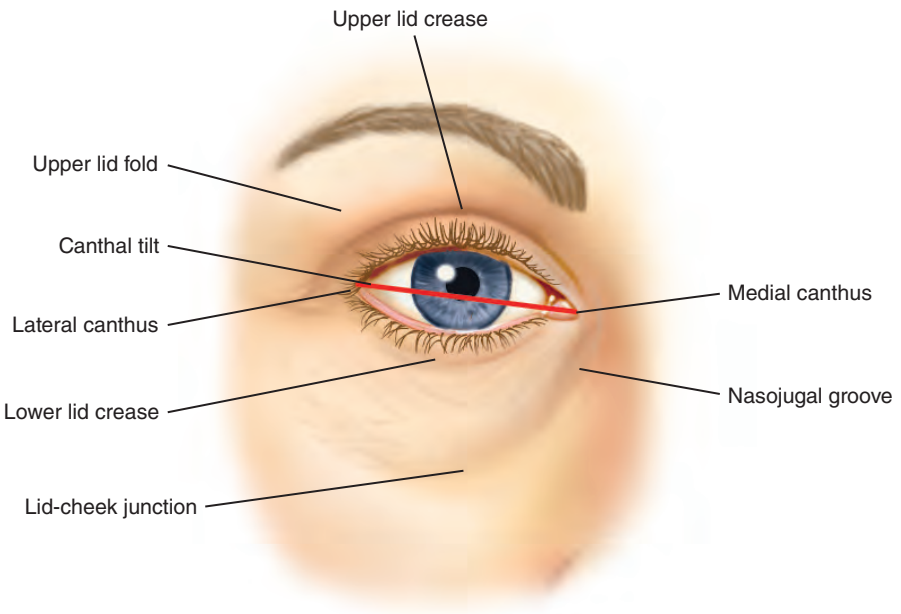

Fig. 1-1 Normal eyelid surface anatomy demonstrating the upper lid fold, the upper lid crease, and the relationship of the lateral canthus to the medial canthus, which creates the canthal tilt.

The palpebral fissure is the opening between the eyelid margins; the standard size is 28 to 30 mm horizontally and 9 to 10 mm vertically when the lids are open. The upper eyelid rests at the upper limbus in children and 1.5 to 2 mm below the upper limbus in adults. The lower eyelid is usually positioned at or 1 mm above the lower limbus.

The commissures are the junction points at which the upper and lower eyelids meet medially and laterally, whereas the medial canthus and the lateral canthus are the angles formed by the eyelids at these commissures. The lateral commissure rests on the globe, whereas the medial commissure is separated from the globe by the caruncle and the plica semilunaris.

Eye Fissure Shape

The lateral canthal angle is formed by the lateral commissure, and it is most commonly positioned superior to the medial canthal angle. A line drawn from the lateral canthus to the medial canthus has a slight upward lateral inclination that defines the orientation of the palpebral fissure; this is called the *canthal tilt*. A line drawn horizontally from the medial fissure to the lateral orbit defines a neutral canthal tilt. The position of the lateral canthus, however, has significant variability according to age, family traits, sex, and ethnicity. A positive canthal tilt is present when the lateral canthus is located superior to the medial canthus. A negative canthal tilt is present when the lateral canthus is inferior to the medial canthus; this involves a higher risk of lid malposition after lower blepharoplasty, especially when lateral canthopexy is not performed. A negative vector is seen on the lateral view with the anterior portion of the globe anterior to the maxilla in the midline sagittal plane. This is also seen in patients with prominent eyes, and it involves an increased risk of lower lid malposition after lower blepharoplasty without lateral canthopexy. A positive vector indicates a deep-set eye. The upper eyelid margin forms a gentle arch, with the highest point being just above the pupil and the lateral limbus.

Exposed sclera within the eyelid fissure on either side of the cornea forms the scleral triangles (Fig. 1-2). The borders of the upper lid margin, the lower lid margin, and the corneoscleral limbus form the medial and lateral white-appearing scleral triangles, with the apex of one triangle located at the medial canthal angle and the other found at the lateral canthal angle. When attempting to define eye fissure shape, it is important to note that the cornea is approximately the same size in adults. The perception of shape is really based on the shape and size of the white scleral triangles on either side of the cornea. The medial triangle remains constant, whereas the lateral scleral triangle is larger and more pointed and varies more with changes in eyelid position; this is particularly true for the lower lid. Thus an appreciation of the preoperative size of the scleral triangles is important in analyzing postoperative complaints about eye shape. Lateral canthal phimosis is caused by dehiscence of the lateral canthus, with medial migration of the lateral commissure and a decrease in the size of the lateral

scleral triangle. Common complications after blepharoplasty include webbing of the lateral commissure with a loss of the defined tip of the lateral scleral triangle.

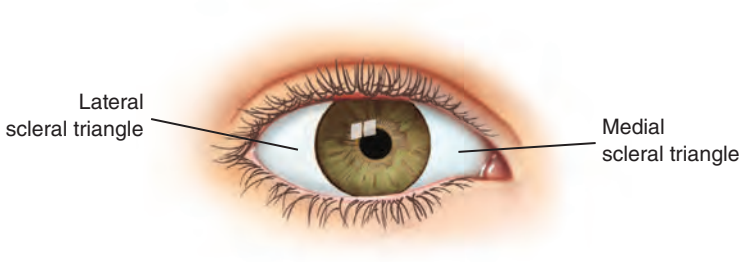

Fig. 1-2 The white scleral triangles formed by the medial and lateral canthal angles determine the patient's perception of eye shape and should be evaluated before eyelid surgery procedures.

Upper Eyelid Crease and Sulcus

The upper eyelid crease is formed by the insertion of levator fibers into the pretarsal skin. During upper eyelid surgery, particularly in patients undergoing blepharoplasty or levator surgery, the lid crease must be reformed with supratarsal fixation of the attachment of the eyelid skin and the pretarsal orbicularis muscle to the levator aponeurosis or the superior tarsal margin. The eyelid crease in Asian individuals is much less pronounced and may be very close to the eyelid margin (often 4 to 5 mm superior to the lid margin), because the superior orbital septum inserts on the levator aponeurosis at this low level (Fig. 1-3). This prevents the higher cutaneous insertion of the levator aponeurosis that is seen in Asian people, in whom the crease forms at 9 to 10 mm above the lashes in adults and at 5 to 7 mm in children.

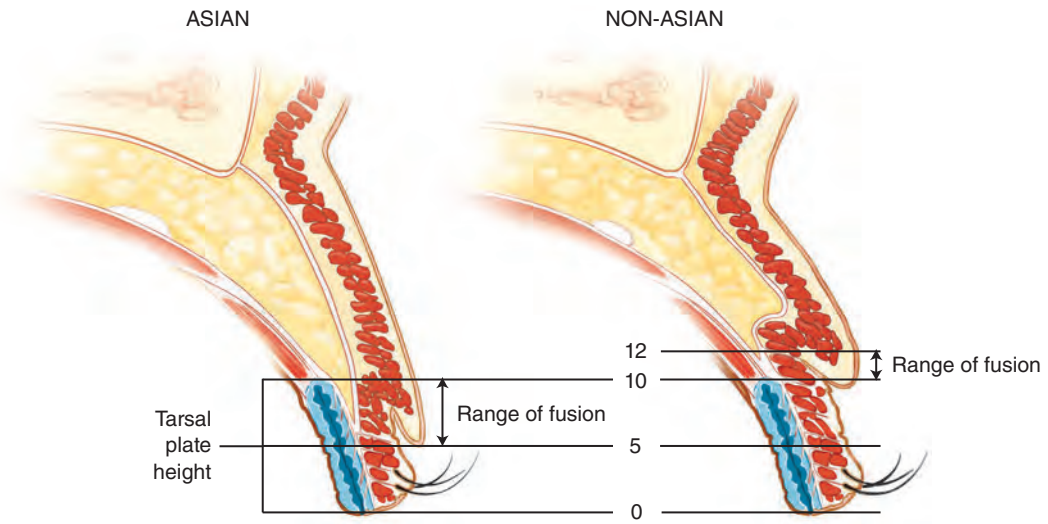

Fig. 1-3 Sagittal view demonstrating the differences seen in the fusion of the levator aponeurosis and the orbital septum when comparing the upper eyelid of an Asian individual with that of a non-Asian individual.

The pretarsal space is the area of skin above the eyelashes in which the skin and muscle are firmly attached to the underlying tarsal plate and normally not folded or wrinkled. It is visible to varying degrees, depending on the amount of overhanging upper lid fold, which is the loose skin above the upper lid crease. The eyelid crease is the upper edge of the pretarsal area, whereas the eyelid fold is the redundant skin above the crease that folds over the crease (Fig. 1-4). The restoration of pretarsal space visibility is the goal of upper lid blepharoplasty; maintaining the integrity of the pretarsal space is also important during ptosis surgery. Another type of skin fold of the upper lid or the inner canthus is the epicanthal fold, which is present if the inner canthus is obscured by an extension of an upper or lower lid fold. The epicanthal folds that are commonly seen in Asian individuals may rarely occur at the lateral canthus after surgery or trauma. The Asian epicanthal fold can be anterior or posterior to the crease; it should be respected during blepharoplasty unless the patient desires the removal or reduction of the epicanthal fold.

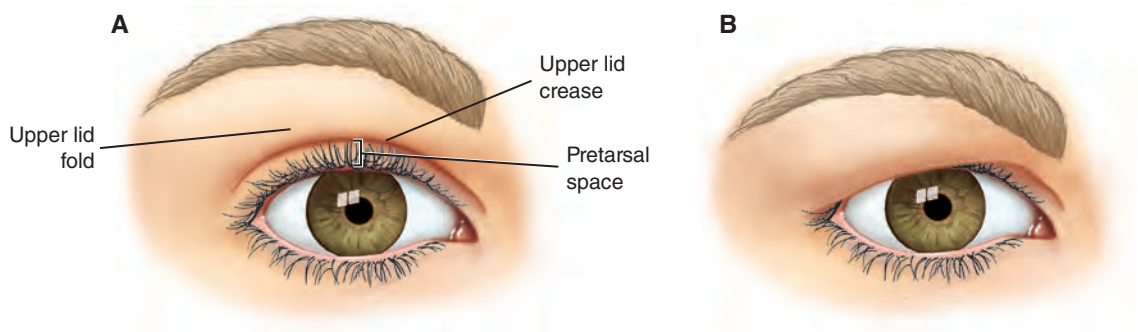

Fig. 1-4 **A,** The upper lid crease is shown above the pretarsal space; this is sometimes known as the "eyeshadow space" among female patients. **B,** The upper lid fold is created by the excess skin and the muscle or fat that overhangs the crease.

The upper eyelid sulcus is the concave area between the upper eyelid crease and the superior orbital margin. A sulcus may not be present in individuals with relaxation of the upper septum and outward folding of the skin. Focal bulging or convexities into the upper eyelid sulcus, especially medially, denote the herniation of orbital fat. With the orbital volume loss that is often seen as a result of aging, orbital fractures, or enucleation, the upper eyelid sulcus can become deep from a lack of support of the orbital tissue; this is termed *deep sulcus syndrome.*

Lower Eyelid Crease and Malar Area

The lower eyelid crease is less well defined than the upper crease. It is formed by the dermal insertion of the lower lid retractors into the dermis. The lower eyelid crease begins medially 4 to 5 mm from the eyelid margin and slopes slightly as it moves temporally. In the malar area, an oblique crease called the *tear trough* can be seen; it represents the junction between the orbicularis muscle and the orbital rim. The tear trough is also commonly referred to as the *nasojugal groove,* and it is made up of the

thin skin and muscle tissue that overlie the medial orbital rim. It often creates a dark shadow in the medial lower lid that is distinct from the shadows that are caused by bulging lower lid fat pads.

The nasolabial fold is an oblique fold that starts at the junction of the nasal ala and travels to the corner of the mouth (Fig. 1-5). Anatomically, the nasolabial fold represents the fullness just below the inferior border of the malar fat pad and just superior to the crease. The superficial musculoaponeurotic system (SMAS) is a dense, fibrous layer that inserts into the dermis to form the crease just below the nasolabial fold. Skin wrinkles or rhytids result from the interaction of contracting facial muscles and the overlying skin; they are also caused by sun damage and a loss of skin elasticity.

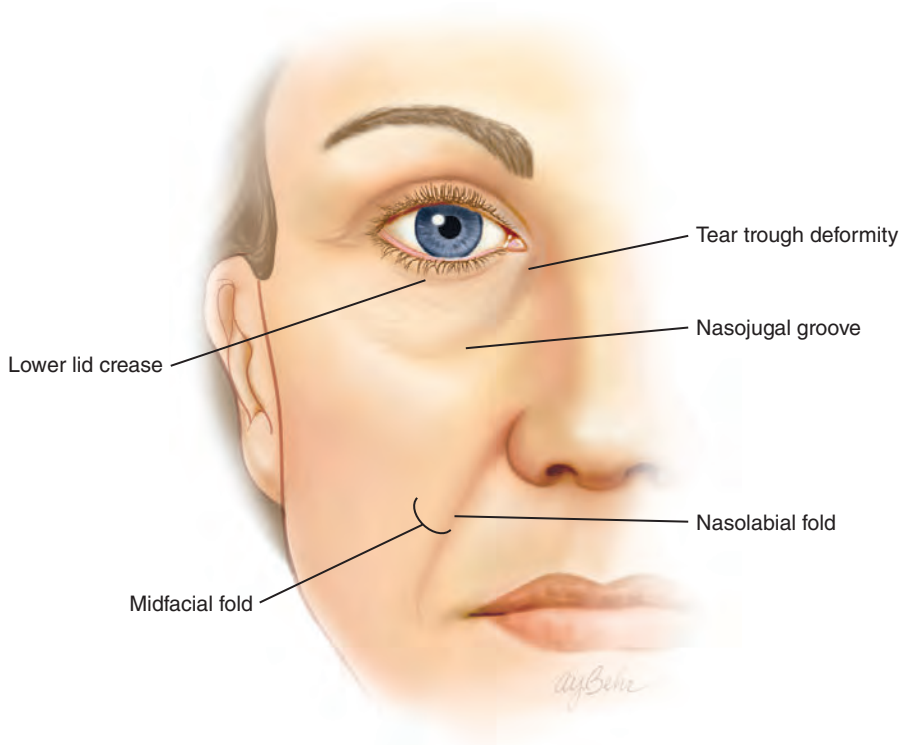

Fig. 1-5 The surface anatomy of the lower eyelid and the malar area demonstrating the lower lid crease, the tear trough, and the nasolabial fold.

"Crow's-feet" or periorbital orbicularis oculi smile lines result from the interaction between the orbicularis fibers and the skin at the lateral canthal area; these are often termed *dynamic wrinkles*, and they are also caused by the loss of elasticity resulting from age and sun damage.

Skin-Muscle Layer

The eyelids can be divided into the anterior and posterior lamellae layers. The anterior lamella consists of the skin and the orbicularis muscle; the posterior lamella is formed by the tarsal plate, the CPF, and the conjunctiva. The skin of the eyelid is the thinnest skin of the body. A distinct transition exists between the thin eyelid skin, which has a thin dermis and lacks subcutaneous fat, and the thicker cheek skin, which has a well-defined dermal layer and subcutaneous fat. Similarly, in the upper eyelid, there is a distinct transition between the thin upper eyelid skin and the thick skin of the eyebrow.

CONNECTIVE TISSUE AND SUPPORTING ELEMENTS

The primary support structures of the eyelids are the tarsoligamentous slings of the upper and lower lids (Fig. 1-6). The tarsoligamentous sling that supports the connective elements includes the posterior lamella, which is made up of the tarsal plates of the upper and lower eyelids and the connecting periosteal attachments called the *canthal tendons*. The tarsal plate should be considered the skeleton of the eyelids, so its repair during eyelid reconstruction is crucial. The orbicularis muscle is densely fixed to the entire anterior surface of the tarsal plate of the upper and lower lids. Posteriorly, the tarsal plates are lined by a tightly adherent conjunctiva that continues on the eyelid margin to the mucocutaneous junction. In children, the tarsal plates and the canthal tendons hold the eyelids firmly against the eye. With aging, the tendons and the tarsus may stretch, which allows the eyelids to be mechanically distracted from the globe by several millimeters.

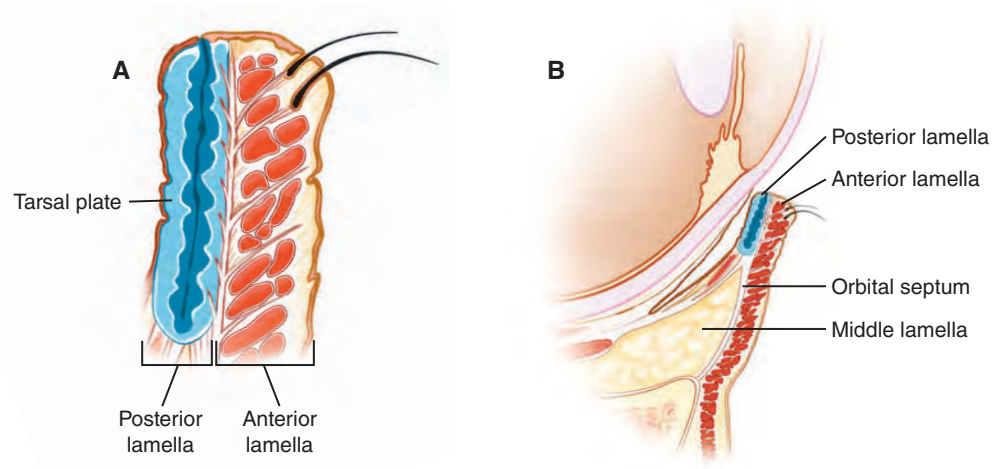

Fig. 1-6 **A,** A cross-section of the lower lid demonstrating the anterior lamella, which is made up of skin and muscle, and the posterior lamella, which is composed of the tarsal plate, the lid retractors, and the conjunctiva. **B,** Sometimes the septum is referred to as the *middle lamella.* Scarring in the middle lamella area likely involves scarring of the orbital septum and the orbital fat.

Tarsal Plates

The tarsal plates are approximately 25 mm long, 1 mm thick, and 10 mm and 4 mm in vertical height for the upper and lower eyelids, respectively (Fig. 1-7). The usual maximal height is about 10 mm, as measured centrally in the upper eyelid. The vertical height of the lower eyelid tarsus was measured in 20 patients who were to undergo lower eyelid resections and in 17 cadavers; the tarsal heights were found to be 3.7 and 3.9 mm, respectively, for these two groups. The upper and lower tarsus should be clearly identified during procedures that involve eyelid repair or reconstruction so that tension-bearing sutures can be placed through the tarsus. Medially and laterally, the tarsal plates have fibrous connections to the orbital rims; these are traditionally called the *canthal tendons*.

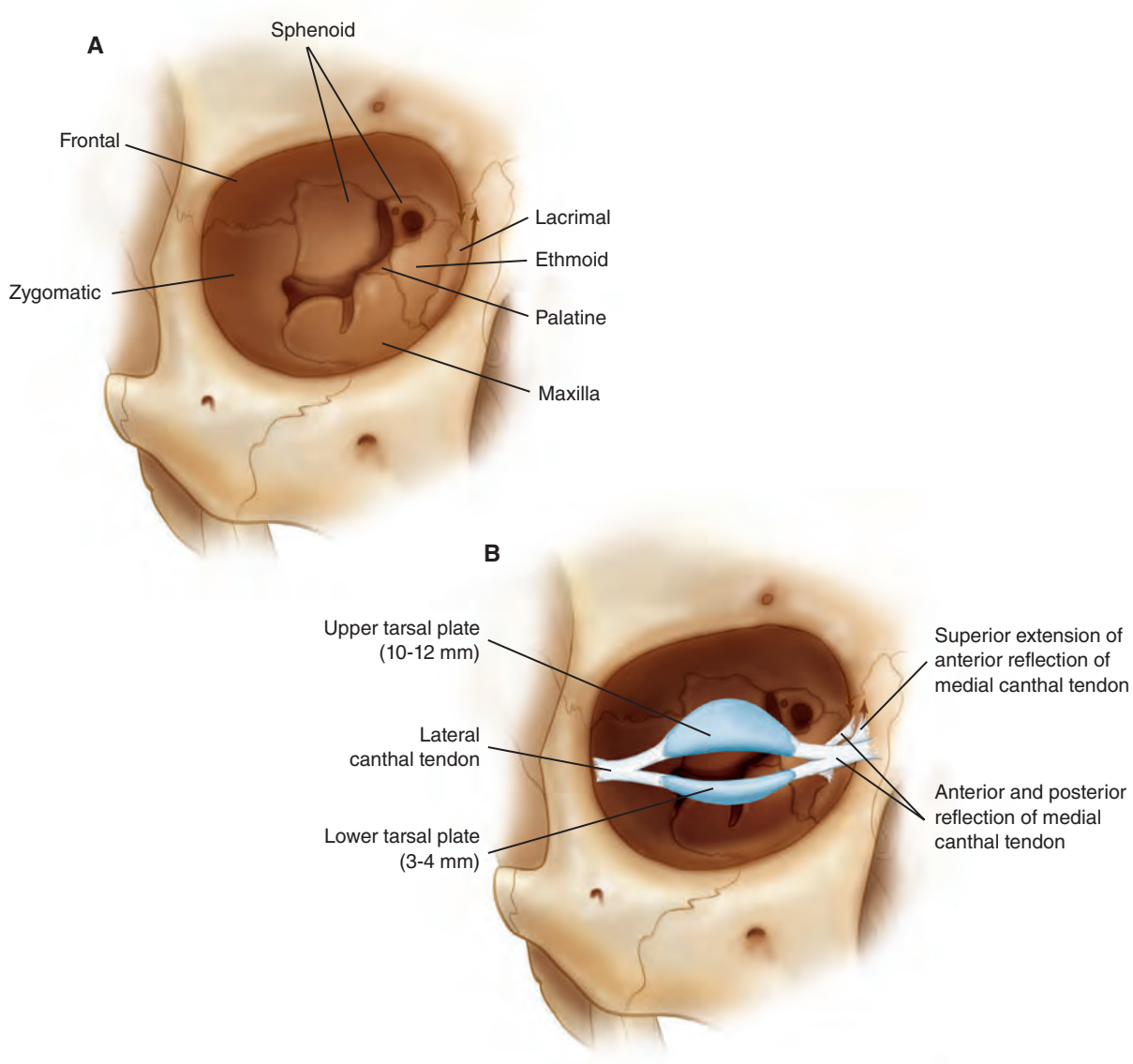

Fig. 1-7 **A,** The seven bones of the orbit include the zygomatic, frontal, sphenoid, lacrimal, ethmoid, palatine, and maxillary. **B,** The tarsal plates and the canthal tendons are the support structures of the eyelid.

Medial and Lateral Canthal Tendons

The medial canthal tendon is a structure with anterior and posterior reflections (Fig. 1-8). Its fibrous extensions are directed toward the anterior lacrimal crest, and it is visible in most people as a white structure just underneath the skin. The posterior reflection of the medial canthal tendon is a fibrous extension from the nasal part of the tarsal plate to the posterior lacrimal crest, which is behind the lacrimal sac; it is the supporting vector of lid curvature and its apposition against the globe. The anterior reflection does not enter into the support of the lid against the globe; rather, it is the point of insertion of the orbicularis fibers. The medial canthal tendon is a double-reflection structure that is reflected both anterior and posterior to the lacrimal sac.

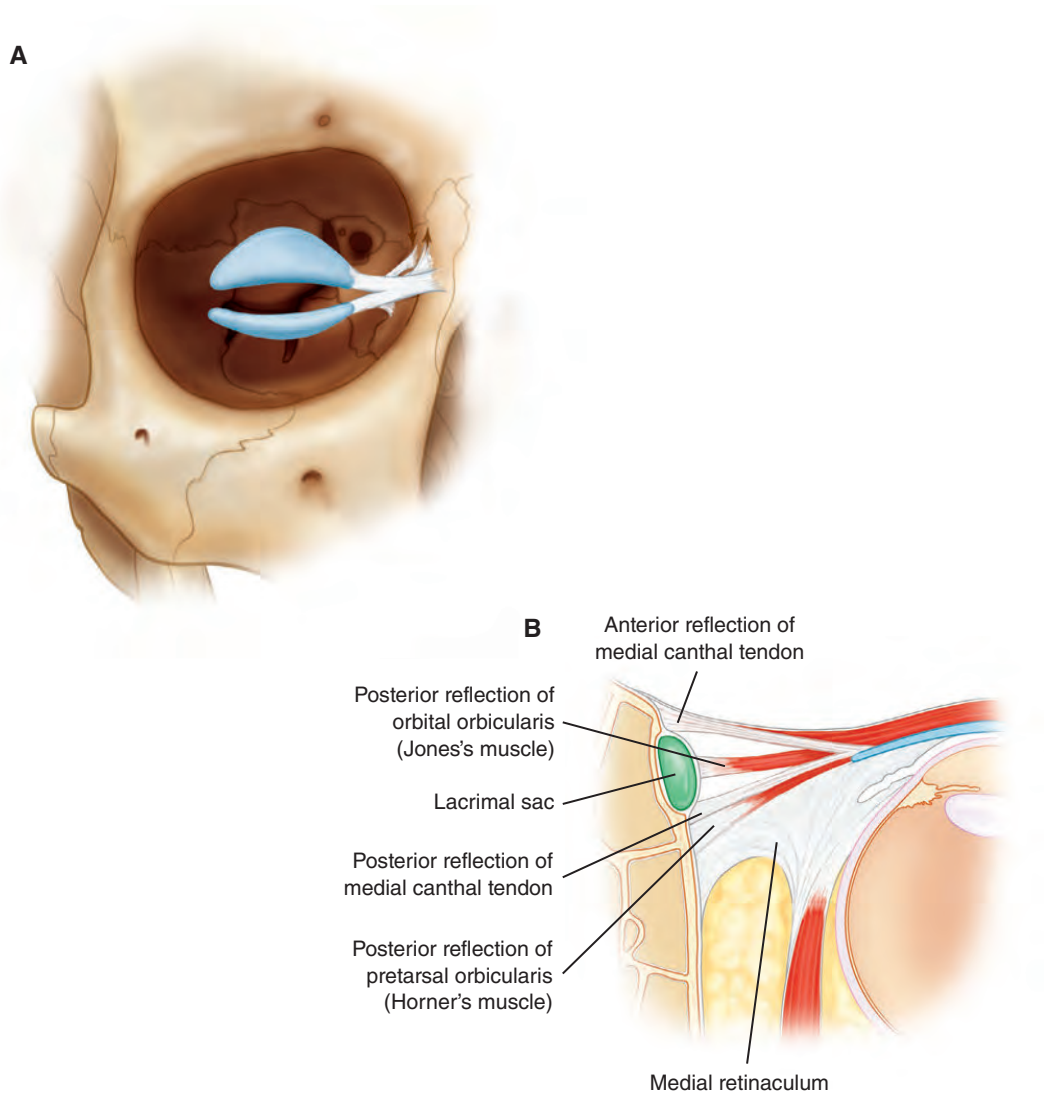

Fig. 1-8 **A,** The medial canthal tendon and the deep and superficial reflections of its insertion. **B,** The anterior reflection gives off a vertical extension anterior to the lacrimal sac fossa, whereas the posterior reflection extends and inserts in the area of the posterior lacrimal crest and the medial retinaculum.