The Eyelid Crease and Double Eyelid Surgery

what you need to know

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This is an informational ebook written for medical professionals as well as non-medical readers who wishes to gain a solid introductory foundation and advanced knowledge of the upper eyelid crease. Interestingly, the eyelid crease is one of the most obscure part of human anatomy and seldom has there been any formal lessons given to medical students and house officers in their formative years of specialty training. For ophthalmic surgeons, the eyelid crease is the portal to which most eyelid surgeries starts and exits. It is therefore of paramount importance that eyelid surgeons, in my view, understands the eyelid crease’s physiology, biodynamics, its susceptible factors, so that the desired surgical result can be obtained with any of the varieties of eyelid surgeries, while leaving behind minimal foot print. This is the goal, or benchmark to which surgery should be set at. It applies to all patients--Asians, Caucasians, and people of all colors, since the need for treatment on eyelids is universal. These principles are applicable to any form of upper eyelid surgical procedures.

The content of this book may be of interest to the casual and curious readers, including patients. The Asian eyelid crease (double eyelid) procedure is one of the most often performed cosmetic surgery in Asia as well as among people of Asian-descent living outside of Asia. Upper blepharoplasty is an integral part and often performed procedure in any medical environment where aesthetic surgery is available. There has always been conflicting information and claims among surgeons of various techniques used in this form of aesthetic surgery. It is for this reason that the Author’s 1995 textbook “Asian Ble-
pharoplasty --A Surgical Atlas”, and subsequently in 2006, a Second Edition “Asian Blepharoplasty and the Eyelid Crease” were published. This current project continues on the evolution of thoughts and newer concepts of which the Author has found relevant in his medical practice. The book has enough illustrations such that even the casual readers should be able to understand the basic concepts involved in double eyelid surgery, even if the seven advanced chapters (of 17-23) should happen to be bypassed. These advanced chapters for the medical specialists will provide a deeper understanding of the biodynamic of eyelid crease, as well as its vulnerability.

Twenty years ago when I started teaching about Asian Blepharoplasty and before my first textbook in 1995 (before such source of comprehensive reference on the eyelid crease were published), some colleagues had asked me why border with sharing what I knew then? I had told them that I did it for the benefit of surgeons who are interested in learning this aspect of cosmetic surgery correctly and to sort out the fog of knowledge, as well as the fact that I felt that my advancing the knowledge in this field will benefit patient care in the long run as well as decreasing complications.

The current goals still include all of the above. To this we added the evolving concepts of mine over the last 15 years (from Chapter 11 onwards) and the ready availability of knowledge base through the Internet in the past 7-8 years (for better, or worse when the glut of information may not all be accurate); this convergence makes the electronic platform an ideal vehicle for access to this knowledge, especially for consumers and patients who are investigating this topic on their own. Compared to the steep price and often lack of access to medical textbooks, it is ever more cogent for this new e-book format to be made available.

The content is best read with the iPAD in a horizontal format, with the Home button on its side. The graphics will be properly displaced in this fashion. Touching the iPad screen will display the small icons on top, tapping the “List” icon on the left upper corner will outline each chapter and its pages at the bottom. Pages are turned with a wiping motion.
Suggestions to readers:

This book serves both as an introductory text as well as an advanced treatise. It can be used as an informative text by the scientifically curious, as well as novice reader and patients who is simply very interested in knowing about the subject. The first two-thirds of the book will be quite sufficient for the non-medical readers as well as the medical professions and eye specialists. It can be read in succession, with the non-medical readers opting to skip the surgical chapters of 8, 9, and 10th if the descriptions are too technical. Videos of surgical steps are provided in Chapters 9, 18 and concept demonstration videos in Chapter 21. (Note: this is an eBook, not a surgical video atlas.)

The content and format is substantially different from my previous work. The language used in this eBook is more first-person and easier to understand to help a wider readership; my original ideas are preserved and improved upon, essential photos are all new and new concepts are introduced in the seven advanced chapters (17-23).

The eight advanced chapters (3, and 17-23) are to provide further in-depth discussions of my latest thinking. Some readers, e.g. specialists and aesthetic surgeons may find the advanced topics highly useful in expanding their views on the topics (which is my humble wish). If one should find that these concepts are too esoteric, quantitative, or obscure without immediate gratification, I apologize; though the beauty of it is that they are there for you to re-visit. The last five advanced chapters (Ch.19-23) are concepts new since the 2006 publication of “Asian Blepharoplasty and the Eyelid Crease”, Second Edition, an imprint that is sold out and no longer available.)

Recently in 2012 I watched a nice documentary movie called “Jiro Dreams of Sushi”, a movie about a sushi chef who operates a small shop in the Ginza subway station in Tokyo, who happens to have earned a three stars rating in the Michelin Restaurant Guide. I find that I can identify quite well with the main character as well as his apprentices. My concepts came about gradually I must admit, like a working shokunin, though it is quite similar to my past experience in the pursuit of any Asian discipline, whether it be the art of Tai-Chi, calligraphy, or ai-ki. Perfection is not reached yet.

With understanding, I hope that you, the readers will gain knowledge that will help you make rational choices as well as for surgeons to properly navigate their operative field.

I hope to be able to share the joy of exploring this field with you. May you enjoy the journey.
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visit www.asianeyelid.com,

www.cosmeticeyesurgery.net

(Knowledge and Wisdom (image on Page i ): Qigong caligraphy written on a script is a gift from Master teacher Dr. Steven Aung; Dr. Aung is Director of the Certificate Program in Medical Acupuncture at the University of Alberta, Edmonton, Canada.)
What is the eyelid crease?

INTERACTIVE 1.1 Chinese written character for double eyelid (an eyelid having a crease).
In common usage, the *eyelid crease* is often meant to describe a natural inward creasing of skin seen in the upper eyelid, typically dividing it into a lower segment adjacent to the upper eyelashes, and an upper segment of skin that starts from the crease to the border of the eyebrow.

The crease is present in about 50% of the Asian population, and found to be more prevalent in all non-Asians. The presence of a crease in an Asian is what differentiates a double eyelid (with a crease unequally dividing the lid into two sections, hence “double”) from an Asian with single eyelid (or mono-lid).

Double eyelid crease surgery (procedures) is a form of surgery to add or supplement an eyelid crease to an individual who seeks it. This is often for an individual who does not have a crease, or find that their crease is insufficient, or unbalanced between the two sides.

The reasons for electing this type of cosmetic enhancement may be myriad, and no individual tend to have the same reasons. The commonly cited and reasonable indications will include a desire to have the eyelid opening(fissure) more apparent, since a single eyelid (without crease) often has a small fold of skin overhanging the opening and makes it look covered over and smaller than it actually is, making it narrower in vertical as well as perceived horizontal dimensions.

Other reasons may be to enhance the ability to apply make-up without smudging, to save time, to correct asymmetry, to create consistency and constancy, or to fulfill their often correct impression that having a crease that simulates a natural crease makes the eye more attractive. The important phrase here is natural. It meant that the single-lided individual almost always want the crease to mimic the dimensions of an Asian double eyelid.

(A) shows a left upper eyelid without a crease.

(B) Same upper lid with a parallel crease. The palpebral fissure(eye opening) is the same in each. The visual perception is that this is bigger than seen in (A).

The means to which this can be achieved, over the last hundred years or more, has been along two surgical tracks. The suture method and the incision methods. They are two totally different approach, not only in terms of philosophy but also surgical and anatomical benchmarks that each set (though the practitioners may not be consciously aware of it). I will explain each in greater details in the ensuing chapters of the book.

The natural infolding of an eyelid crease can be thought of as the end points of fine muscle fibers from the opening muscle (levator aponeurosis, a curtain-like sheet of elevating muscle within the upper lid, like a garage door motor) of the upper lid.
attaching onto the underside of skin; its action contracts the muscle up and dynamically pull on the skin to form the upper lid crease. This levator muscle pulls on the small segment of skin below the crease, the lashes, the lid margin and the tarsus (a fibrous plate along the upper lid margin). When the lids open, the lifting levator muscle is active (by turning on the oculomotor or 3rd nerve’s upper branch), that resting section of skin and deeper soft tissues above the crease (preseptal, above the upper boundary of the tarsus/fibrous plate) relaxes by inhibition of the Facial or 7th nerve, whose normal function is contraction of the orbicularis oculi and facial muscles. There is therefore a facilitation of the skin that is at the narrow boundary of a natural crease to fold inward; and it is almost always along the upper border of the tarsal plate. It is along the interface between an active layer of tissues contracting (levator pulling up on tarsus and small amount of skin adherent to it) and passively gravitating skin on top (with all its underlying muscle strands and fat) which is the larger upper proportion you see in a double eyelid. This is normal physiology in a natural crease. The crease is just demonstrating the net force result of a healthy levator terminating its attachment to the skin’s undersurface. The reverse happens when your eyelid closes: 7th nerve ON, 3rd nerve OFF—the orbicularis oculi muscles that wrap around the eyelid fissure is active and contracts[ON] shut, while the levator is not lifting due to inhibition[OFF]. (The small skin above, overhanging the inward crease is the upper lid fold)

Cross section of the eyebrow, closed eyelids and eye. The upper tarsus (thick arrow) which contains oil glands is usually 10 mm in Caucasian, and 6.5-7.5 mm in Asian women. The inferior tarsus is 3.9-4.0 mm in both. (Pink layer is levator muscle, with the 10 mm length of this pink tissue before the upper tarsus being the aponeurosis segment of the levator).
The questions often posed at academic meetings lately are: “If one sees a crease line anywhere on the upper lid, whether it is lower than the normal insertion point of the levator aponeurosis on the upper lid skin (which normally should be precisely along the upper border of the tarsal plate), or at any point unrelated to the levator, like one or more wrinkled skin crease line within the upper concavity of the upper lid, aren’t these the eyelid crease also? The answer is no! Technically they are just wrinkles, because they are not cause by contraction of the levator muscle. Just like a true elbow crease is formed by the biceps pulling on the forearm bones (radius and ulnar), and not because of just any skin wrinkle left on the arm, or of skin damage or adipose tissues changes. Nor should we call a sunken sulcus (concavity) as a crease that “has migrated upward”. If one adhere to this biodynamic and anatomically-accurate definition of an eyelid crease, there will be much less confusion among medical practitioners as to what is and where to apply a crease, as well as what form of surgery or procedure is a physiologic route. It is indeed curious that there are just as many medical practitioners who are unclear about this as are patients seeking information on this.

The divergence between the suture method and incision method lies at the very core of understanding the natural mechanism of an eyelid crease, and the approaches to which this can be achieved.
A representation of an Asian upper lid with crease (“Double eyelid”). The levator muscle endings (pink layer) has some attachment to the under-surface of the eyelid skin along the upper border of the tarsal plate, where it forms the crease. Thin arrow indicates eyelid crease; darker arrow indicates the overhanging lid fold. (Copyright WPD.Chen)

A representation of one form of scarring involving the skin and the middle space (between the front and back layers) of the eyelid. There is absence of fat and obliteration of the pre-aponeurotic space. (Copyright WPD.Chen.)

(This is a full sample of Chapter 1.)
Chapter 2
Eyelid Crease, shopping for Procedures: Goals & Benchmarks

This is an introduction to some of the factors that are important in lid crease enhancement procedures and upper blepharoplasty, regardless of ethnicity.
The eyelid crease—physiologic definition:

In the very first chapter, I discussed in very common terms but in an exacting way, what an eyelid crease is, from layman’s point of view as well as from a scientific neuromuscular standpoint. They are actually complementary to each other.

The configurations of the upper lid crease in Asians varies greatly. The terminology used to describe these configurations also varies depending on different ethnic groups and languages.

The following examples show the various configurations of Asian eyelids.

a. An eyelid without a crease. There is mild degree of upper lid hooding, causing secondary downward rotation of the lashes.

b. An eyelid with a distinctive crease. This is the parallel configuration.

c. An eyelid in which a portion of the crease has been obliterated.

d. An eyelid with an incomplete or partial crease. The crease originates in the medial canthus and medial upper lid fold and extends halfway across the upper lid.

e. Multiple creases. Two well-defined creases run parallel to each other.

f. A nasally tapered crease. The lateral third of the crease may be the same distance from the eyelash margin as the central third, or it may rise slightly to form a laterally flared crease.

g. A parallel crease shape.

h. A Caucasian upper lid crease. The middle one-third of the crease is farthest from the lash margin.

(Property of William P. Chen, MD, FACS)
In Asians who have a continuous well-formed eyelid crease, the crease may be of: (A) the nasally-tapering crease type, NTC (less preferred terminology is "inside fold") in which the crease converges towards the medial canthus, becoming closer to the lid margin as it reaches the medial canthus and eventually meeting it; or (B) parallel crease, PC, with the crease running fairly parallel to the lash margin from the medial canthus to the lateral canthus. (A less preferable terminology is "outside fold").

<table>
<thead>
<tr>
<th>Parallel shape</th>
<th>PC</th>
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<tr>
<td>Nasally-tapered shape</td>
<td>NTC</td>
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For the nasally tapering crease, towards the lateral end, it may run level to the eyelash margin from the central one-third of the eyelid laterally, or it may gently flare away from the lid margin as it approaches the lateral canthal region, forming a laterally flared crease (LTC).

Significantly, Asians rarely have a lid crease that is semilunar in shape, as we observe in Caucasians(Figure:h). Here, each end of the crease is closer to the respective lid margin than the central portion of the crease. By far, a semilunar crease is one of the most frequently heard complaints from Asian patients that have underwent blepharoplasty here in the United States and North America\(^2\). The crease is often too High, Unnatural and Harsh.

A crease that is located at a height of 8.0 to 10.0 millimeters from the ciliary margin is considered “too high” for Asians. This may be a result of surgeons adhering to an empirical formula for the height of the lid crease; or in following techniques of supratarsal fixation where a distance of 9-10 millimeters or more is applied without regard to ethnicity, since for Caucasians the upper tarsus usually measures 10 millimeters in its vertical dimension. In either case, the crease looks excessively high when it is applied on an Asian patient for the following reasons: First, Asians are usually smaller in build and their upper tarsus measures only 6.5 - 8.0 millimeters in height on the average. Second, the distance between the eyebrow and the upper lid margin is proportionately less in Asians. Therefore if one were to apply a crease at 10-12 milli-
meters from the lash margin, it would look much closer to the mid level(section) of the upper lid.

When the crease is farther from the lid margin than the height of the tarsus is for that patient, the surgically-applied crease traverses through thicker dermis as we get closer to the brow and is more likely to be associated with hypertrophic scarring. Being farther away results in less camouflage by the upper eyelashes and the crease is more exposed to scrutiny by the individual and their peers. It also bring in associated functional problem that will be covered later (in advanced Chapter 21). I consider a crease as *harsh* when it is overtly prominent, deep, and indurated with dermal reaction.

By "unnatural", I mean that the crease assumes a shape that is aesthetically not attractive on the face of the individual. The main offender is a semilunar crease. The overall impression of a crease positioned high and with a semilunar shape leads to an unnatural look for that Asian individual. Another cause for an unnatural crease is if an excessive amount of pre-aponeurotic fat pads were removed. When a major portion of the fat pads are removed in the pre-aponeurotic space, the result is a hollowed-eye look ("famined-look") which appears incongruous in the relatively flat facies of the Asian\(^2\). By contrast, removal of pre-aponeurotic fat pad may be a necessary step in age-related cosmetic blepharoplasty for those Caucasian who in their youth had a deep set supratarsal sulcus (of course, not all Caucasians have deep set sulcus; for those who had full eyelids, some fat preservation is desirable).

This diagram above from my first textbook in 1995 shows a 10 mm crease that is slightly semilunar in shape, hypothetically applied on an Asian eye anatomy (solid lines). This would be considered a very high crease and not the typical Asian crease.
shape configuration. (It can be mimicked by using popular accessories like lid crease tape, or strings like Mezaike fiber thread—all of which are temporary devices.) The solid arrows are the line connecting each of the ends of the semilunar crease towards the Asian eyelid’s true corners. They cross at an angle theta-2. If one superimpose a Caucasian eyelid opening where the horizontal dimensions are 10% larger (which they often are), keeping the same vertical opening (semi-dotted outline of eye opening) with the exact same semilunar crease shape and height, the crease will form a smaller angle of theta-1 when one joins the crease ending towards the respective corner of the Caucasian eye’s corners.

Angle of theta 2 > theta 1

This helps explain why a semilunar crease applied to an Asian will make the eye opening appear rounder than it should, though it may be perfectly suited for a Caucasian anatomy.

It is important to recognize that there is a high degree of variation in the anatomy of the upper eyelids of Asians. A common misconception is that all Asians are born without an upper lid crease. In actuality, half the Asian population does have a natural crease. For each person, the shape and height of the crease and the relation of the crease to facial configuration should be part of the overall assessment before a cosmetic surgical procedure is performed.

Stitch Methods Compared to Incisional Methods:

Stitch method (buried sutures method): If one is to describe any externally applied skin/eyelid compression (like using a paper clip wire, or a device like the externally applied lid crease thread fiber from Japan), or several buried stitches that actually course through the eyelid’s full thickness from front to back (skin to conjunctiva) or back to front (conjunctiva to skin), and then refer to these resulting indentations as an eyelid crease, one would be mimicking a crease, at a location that is not always physiologic. The sutures used in the buried suture method are often necessarily permanent (like nylon, meaning they do not dissolve). Dissolvable sutures in suture methods would not be very effective. The crease from it is passive and noticeably present on downgaze, which is unnatural. This mimic is generated from externally-applied and compressive (constricting) sutures inserted over and through a physiologic muscle, at ninety-degrees to its normal axis of function and at several disparate points. It is this Author’s view that this is dampening to its normal function.

External Incision methods: If one were to select the incision method, the method itself requires a greater learning curve on the part of the surgeon, but he has several advantages once he mastered the concepts and practices diligently to achieve adequate competency. The method allows for the redundant skin fold hanging down onto a single eyelid to be reduced to expose a larger eyelid opening, greater control of crease height and shape, greater control in creation of a physiologic crease, a dynamic lively crease that should naturally fade (shallows,
diminishes) when the lid is relaxed as in looking downward (without seeing the stitch-induced dimpling on the skin surface), and it can be achieved without having to use buried permanent stitches. It is simulating what a natural crease comes from, through fine strands of the end portion of the levator aponeurosis attaching to the under surface of skin along where a natural crease would have formed, if the person was to have been born with crease. All sutures are removed after 7-10 days as there is really no need to use anchoring stitches, whether dissolvable or permanent. The simulation is close to being natural as the crease is generated from internally generated contractile force of the elevator muscle (levator), going with the flow.

One can compare the two methods as if one is trying to create an elbow crease on the crease-less arm of an imaginary model. The suture method can be used to create a “crease” almost anywhere on the forearm and arm that has skin. If applied too short or low down on the arm like a tourniquet, it is on the forearm side of the elbow joint, it may not be physiologic but you will see the indented mark that mimics an elbow crease. If done too high (on the arm or bicep’s portion), the crease will look unnatural and may actually hamper the contractile function of the biceps. Besides, the recipient will feel its presence within its muscle tissues.

These patients’ complaints regarding their lid crease sutures after buried stitch methods are not hyperbole, as we see high placement of crease from the suture method often resulting in ptosis, and generate muscle-awareness on blinking, and even foreign body sensation when the sutures are buried close to the surface. Low placement of buried stitch often results in eventual disappearance of a crease, or it leaves behind a dimple scar.

Finally there is the issue of permanency. It is generally accepted that the buried stitch method has a higher rate of crease disappearance (failure rate), which can occur since it did not perform any removal of excess and interfering tissues, the buried sutures can also lose effectiveness as it is tied relatively tight to achieve its compressive ligature effect, thereby prone to cut through (cheese-wire) through its target tissues.

Sometimes one stitch among the three or four buried stitches may come loose or lose its effectiveness while in place, and that segment of the compressed crease will then regain its previous fullness, so the crease will look incomplete or lose its continuity as well as not achieve permanency.

We have touched on the fact that, historically and from population standpoint, most natural Asian crease SHAPE are in either nasally-tapered (where the upper crease narrows towards the inner corner of the eyelid skin and touches it) or a parallel shape, where the crease runs parallel like a ribbon along the eyelash line (lid margin). These are of course arbitrary concepts we use to describe anatomy, in reality there are probably many intermediate forms between parallel and tapered crease as you may have a crease dipping close to the inner corner but not quite touching the corner (should one call this “mostly parallel” or “tapered yet not touching”?).
In terms of height of crease (how broad is it in the mid-section of the eyelid opening?), it is this Author’s opinion that there is a very narrow corridor for variation in the crease height (measured in millimeters). It should be linked to the actual physical dimension of the person’s upper eyelid tarsal plate (discussed in Chapter 1). The upper border often dictates where the crease should be located on the mid-section of the skin side of the upper lid. One can go a touch lower, but not much higher than this level to be natural, without treading into areas of possible complications and sub-optimal results.

(We will revisit SHAPE, HEIGHT, CONTINUITY and PERMANENCY as specific talking points in the following chapter on Consultation and Counseling).

Does the Physician dictate what is physiologic and acceptable? or should he go with prevailing fad?

Here I like to share some personal views. The majority of patients are less knowledgeable about medicine than the physicians, and it is the medical practitioner’s duty to advise the patients on what is proper, normal and natural in terms of treatment outcome and expectations. The Physician is sworn to the Hippocratic Oath of Healing of “do no harm”.

In aesthetic surgery, the scenes are a bit warped in that for whatever reason, there are individuals---patients as well as doctors, who feel that their opinions over-rules everybody else’s in the room as well as any conventional wisdom. Besides patients with body dysmorphic issues, there are those occasional patients who may like a very high crease, and without understanding the risk involved, will request that it be done that way and the surgeon actually complies. In situation like this, it is important for the physician to be knowledgeable and have the discipline to advise the patients of his concerns when faced with an unconventional request, and not be swayed to go the patient’s way. It is especially important not to go the way of the current fashion or media fad. This discrepancy in knowledge level may be skewed in either directions, through ignorance of the patient, or an over-bearing patient facing a less than informed surgeon.

(By the way, a tapering crease that is sloping to the inner corner but not touching is still considered a parallel crease in my opinion, as the upper and lower lid always join at the medial canthus with the upper lid margin sloping downward.)

REFERENCES:


(This is a full sample of Chapter 4)
This chapter deals with the technique used by this Author to facilitate the likelihood of forming a crease in a single-lided individual: by effective removal of redundant hindering tissues (proper orientation of the removal of different layers so as to allow natural closure), minimization of scar from tension, and thorough completion of each step with lessened postoperative swelling. The steps are applicable to any form of upper blepharoplasty, whether primary or revisional, Asians or non-Asians. (Published 1996)

Conceptual cross section of upper lid: the right boundary is skin surface, the left boundary the sheath of the orbital septum; between these two layers are the orbicularis oculi muscle. The lower edge is the superior tarsal border. Pink zone denotes one scenario of the amount of orbicularis oculi that can be removed.
In previous publications1-6, I discussed the concept of upper eyelid crease configurations and the essential steps required for predictable placement of a lid crease for single eyelid patients. This method is based on accurate measurement of the central height of the upper tarsus, using it to guide placement of the external incision line for formation of the crease. It was mentioned that the ideal crease tend to be of either the nasally tapered crease or the parallel crease configuration. Medial upper lid fold is often present in the medial portion of the upper eyelid of Asians, whether they have a crease or not, and should not be considered pathologic and radically removed.

SURGICAL STEPS

Marking of Crease

I use the shaved-off tip of a wooden cotton-tip applicator dipped in methylene blue to mark the proposed crease. Between 0.5 and 0.75 ml of anesthetic is used to achieve sensory anesthesia of the upper lid several minutes prior. I evert the upper lid and measure the vertical height of the tarsus over the central portion of the lid with a caliper. This measurement is usually between 6.5 and 7.5 mm. It is carefully transcribed onto the external skin surface, again over the central part of the eyelid skin. This point directly overlies the superior tarsal border and will serve as a reference point for the overall crease height along the central one-third of the eyelid, whether the crease shape is to be nasally tapered, parallel, or laterally flared. For those patients who have a crease, I also measure the tarsus to confirm that the crease that I am observing, if I am planning to preserve or enhance it, is indeed the correct crease line to use. If the crease is to be nasally tapered, I mark the medial one-third of the incision line to taper toward the medial canthal angle or to merge with the medial upper lid fold. The lateral one-third is marked in either a leveled or flared configuration. For a parallel crease, the measured height of the superior tarsal border is drawn across the eyelid skin. To recapitulate, the height of the tarsus determines the overall central position of the surgical crease; the shape is determined by how you design the medial and lateral thirds of this according to the patient's preference.

Skin Incision/Skin Excision

To create adequate adhesions, it is necessary to remove some skin plus subdermal tissue. A strip of skin measuring approximately 2 mm is then marked above and parallel to this lower line of incision. In the patient who desires a nasally tapered configuration, I taper this upper line of incision toward the medial canthal angle or merge with any medial upper lid fold that may be present. As a result, the skin excision is often less than 2 mm over the medial portion of the crease.
The incision is then carried out with a no. 15 surgical blade (Bard-Parker) along the upper and lower lines, incising just beyond the subcutaneous plane. I control any fine capillary oozing with a bipolar cautery. (The strip of skin bounded by the upper and lower lines of incision may be excised with scissors, or preferably, it is excised after the orbital septum is opened along the superior line of incision and the skin orbicularis-orbital septum flap is turned inferiorly along the superior tarsal border, see below). The excision of a strip of skin is not necessary in every case; however, it is my belief that it facilitates removal of subsequent layers of the lid tissues, thereby allowing adequate crease formation.

Opening of Orbital Septum

At this point, the superior tarsal border is still covered by pretarsal and supratarsal orbicularis oculi muscle, possibly some of the terminal portions of the septum orbitale, and the anteriorly directed terminal fibers of the levator aponeurosis beneath the septum. To open the septum, I retract the upper incision wound superiorly and use a fine-tipped monopolar cautery, in the cutting mode, to incise through the orbicularis and orbital septum in a beveled fashion along the upper skin incision line. In Asians, the orbital septum may be only 2 to 3 mm above the superior tarsal border. It is readily opened, exposing the underlying preaponeurotic fat pads.

Excision of Preseptal Orbicularis and Orbital Septum

After the septum is opened horizontally, the strip of skin, supratarsal orbicularis, and orbital septum hinged along the superior tarsal border is excised. It consist of approximately 2 to 3 mm of skin, a greater amount of supratarsal orbicularis muscle, and a variable amount of the orbital septum (trapezoidal debulking of preaponeurotic tissues).

Preaponeurotic Fat Pads

Depending on the degree of fullness of the upper lid, I may use a sharp scissors to excise a small amount of the preaponeurotic fat pad. I control any bleeding points with a bipolar cautery. (The fat excision often requires a small supplement of lidocaine in the space beneath the preaponeurotic fat pads.) If a patient with dermatochalasis and obliteration of the crease should manifest even a very minimal concavity in the supratarsal sulcus, I would not remove any fat, since it will worsen the hollowness and result in multiple redundant folds superior to where one wants the crease to be.

Excision of Pretarsal Orbicularis

To facilitate in-folding of the new crease, I excise a 1 to 2 mm strip of pretarsal orbicularis muscle along the inferior skin incision edge. There are some authors who routinely debulk the entire pretarsal subcutaneous tissue, believing that it is better to have only skin covering the
anterior surface of the tarsus. My experience differs, and I remove some pretarsal tissue only if pretarsal fat is quite abundant and threatens the surgical formation of the desired upper lid crease. In the pretarsal plane of a creaseless Asian eyelid, there are few, if any, terminal interdigitations of the levator aponeurosis to the dermis. I refrain from vigorous dissection along the pretarsal plane, as I feel that it creates prolonged postoperative edema and can risk undesirable formation of more than one crease. Furthermore, it is quite natural for Asians born with a natural crease to have some degree of pretarsal fullness along the area between the crease and the eyelashes.

Formation of Lid Crease and Closure of Wound

In order to form a dynamic crease, the terminal fibers of the levator aponeurosis above the superior tarsal border should be directed to the subdermal plane of the lower line of skin incision. I use 6-0 non-absorbable suture (6-0 silk or nylon) to pick up the lower skin edge and subcutaneous tissue to the levator aponeurosis along the superior tarsal border and then the upper skin edge and tie each of these as an interrupted suture. Besides the stitch over the center of the crease, I place two or three sutures medially and two laterally. With these five or six crease-forming sutures in place, the rest of the incision may be closed with 6-0 or 7-0 nylon in a continuous or subcuticular fashion.

**CONCEPT OF TRIANGULAR, TRAPEZOIDAL, AND RECTANGULAR DEBULKING OF EYELID TISSUES**

During a double eyelid procedure by way of the external incision method, leaving behind a platform of tissues anterior to the superior tarsal border will interfere with the definition and formation of the proposed crease. The various attempts in removing skin, skin with orbicularis, skin with pretarsal fat, and skin with muscle and septum and preaponeurotic fat are all attempts at creating a clear platform for the formation of adhesions between fibers of the levator aponeurosis and the subcutaneous structure of the surgically created crease.

Triangular and trapezoidal debulking allows a systemic and uniform cleaning of the preaponeurotic space along the superior tarsal border and the pretarsal plane.
Schematic drawing of Asian upper eyelid without upper lid crease: Black dots correspond to lines of skin incision. Solid arrows correspond to trans-orbicularis vector from skin to orbital septum or orbicularis to skin. Dashed arrows show possible plane of dissection through the preaponeurotic fat pads. Trapezoidal debulking of preaponeurotic tissues in Asian blepharoplasty may include all tissues bounded by the upper and lower trans-orbicularis vectors and the tissue between the skin and the orbital septum. Minimal fat excision may be included.

As the drawing shows:
1. When skin excision (≤ 2 mm) is carried out in conjunction with the lid crease placement, retracting the upper skin incision edge allows an upwardly beveled plane of dissection to proceed across supratarsal orbicularis oculi muscle and the lower portion of the orbital septum. (In Asians who do not have a crease in the upper lid, the orbital septum is frequently fused to the levator aponeurosis at 2 to 4 mm above the superior tarsal border, and it can be as low as halfway down the anterior surface of the tarsus.) The septum and underlying preaponeurotic fat pads are easily identified.

2. The septum orbitale is opened horizontally. The trapezoid of preaponeurotic tissues (viewed in this cross section) includes occasionally a minimal amount of preaponeurotic fat, the orbital septum, supratarsal orbicularis, subcutaneous fat, and overlying skin (≤ 2 mm); all of which hinge along the superior tarsal border may be debulked. The anterior surface of this conceptual trapezoid consists of the skin, while the posterior portion of the trapezoid is wider and includes all preaponeurotic tissues from the opened orbital septum down to the superior tarsal border.

3. A small strand of the pretarsal orbicularis along the inferior skin incision may be trimmed off.
4. The *trapezoidal* debulking allows easy inward folding of the skin edges toward the underlying aponeurosis, facilitating surgical formation of the crease. (Collin's electron microscopic study described insertions of distal strands of the levator aponeurosis into the septa in between pretarsal orbicularis muscle fibers rather than into any subdermal tissue along the lid crease in those eyelids which had crease. Should this be the case, formation of a crease may be facilitated by the preceding surgical maneuver because it links the aponeurosis to the upper border of the pretarsal platform. Vigorous dissection and debulking of pretarsal tissues are to be avoided because they tend to lead to persistent edema and formation of multiple creases.)

If debulking is carried out without including any skin excision, the block of tissue removed resembles a *triangular* configuration in cross-sectional view.

If the patient has a great deal of skin redundancy, the amount of skin included for excision is increased by expanding the upper line of skin incision. The plane of dissection through the orbicularis becomes less beveled and the trapezoidal debulking gradually turns into more of a *rectangular* configuration.

The schematic diagram above shows the trans-orbicularis vector (step 2) for the dissection plane rotating counterclockwise and leveling off as one removes more skin and the upper line of skin incision [1 (u)] moves further from the superior tarsal border.

The first surgical step involves upper and lower lines of incisions, 1 (U) and 1(L) above the superior tarsal border are skin incisions.
The second step 2 involves an oblique transection through the orbicularis by the trans-orbicularis vector line.

In the third step (3), upon reaching and opening of the orbital septum, one dissects inferiorly toward the superior tarsal border.

Step 4 shows a leveled excision of orbicularis and redundant skin above the superior tarsal border.

The first trans-orbicularis vector(Step 2) rotates and levels off as more skin needs to be removed such that the cross section of soft tissues that are debulked changes from a triangular to a trapezoidal, and finally rectangular configuration. (From Chen, W. P: “Asian Blepharoplasty and the Eyelid Crease, with DVD”. Published by Butterworth-Heinemann, Elsevier Science, 2006.)

Triangular debulking < trapezoidal debulking < rectangular debulking
(where < represents: less than.)

In triangular debulking (without skin removal),
Orbicularis ÷ Skin = Infinity (or n, with n >> 1)
(vertical measurement of tissues)

As you proceed to trapezoidal and rectangular debulking, the ratio of orbicularis to skin removal (as measured vertically) approaches 1:1 (n getting close to 1).

This ratio will be less than 1.0 only when the amount of skin redundancy is truly excessive, as in an elderly individual, allowing the removal of excessive skin without compromising wound closure and predisposition to ectropion and lagophthalmos of the upper lid. In this situation, a "reverse" trapezoidal block of tissue is removed, with the height over the skin side greater than the height of the preseptal orbicularis excised.

Even with a great deal of skin removal, the traverse through the orbicularis muscle (transorbicularis vector, Step 2) should remain perpendicular to the levator palpebrae superioris muscle.

Therefore, in young individuals,
\[
\frac{d_{\text{orbicularis}}}{d_{\text{skin}}} \gg 1.0
\]

and in elderly individual,
\[
\frac{d_{\text{orbicularis}}}{d_{\text{skin}}} = 1 : 1 \text{ (occasionally } < 1.0 \text{ )}
\]

In conclusion, the applications and advantages of trapezoidal debulking in Asian blepharoplasty are as follows:

1. Easier approach through the orbital septum when the plane of dissection is beveled.
   It lessens potential injury to the levator aponeurosis when there is a buffer of preaponeurotic fat pad underneath the septum.

2. It allows for a controlled, uniform debulking of the preaponeurotic platform in the supratarsal and pretarsal regions.
3. Allows optimal formation of adhesions between the levator aponeurosis and the inferior subcutaneous tissues of skin along the superior tarsal border, or to intermuscular septa within pretarsal orbicularis muscle fibers (pretarsal platform).

4. Allows crease formation to be based on the individual's tarsus height.

5. Reduces the complication rate: including issues with asymmetry, shape, height, continuity, permanency, segmentation of the crease due to uneven planes of dissection, fading and late disappearance of crease, multiple creases, and persistent edema.

SUMMARY
There has been continued refinement and understanding in the concepts of Asian blepharoplasty. Among Asians, aesthetic upper eyelid surgery to convert a creaseless upper eyelid (popularly referred to as "single eyelid") to one with a crease ("double eyelid") is the most frequently performed cosmetic surgery in Asia and among Asians living in the Western hemisphere. I have described my approach to this surgery, utilizing a tarsal height-based external incision method plus asymmetrical debulking of the preaponeurotic tissues, including some fat, septum orbitale, pretarsal and preseptal orbicularis oculi muscles, and preseptal skin.

References:


(This is a full sample of Chapter 11)
This chapter deals with the fine nuance of eye plastic surgery and adaptive solutions in blepharoplasty.
Optimal Healing--How to be a ninja surgeon:

It is always desirable to be able to enter and exit the eyelid (through an existing crease) without leaving much footprint. If one can strive to enter, perform the necessary task to the exact degree one had planned for, execute the plan without significant trauma, and exit without causing new impairment than before, leaving the area accessible for reentry if indicated in the future---that would be ideal. In essence, the ninja way.

Of course, none of us are as good as these fabled characters, and neither am I. I do insist however, that one should think, analyze and plan to perform in this fashion.

There are many factors that contributes to optimal wound healing. We commonly think of the way we apply stitches, how we tie them, dress the wound, and removing the sutures as the major factors. While these are all true, there are facets of specially adopted surgical techniques itself that contribute just as significantly to the overall natural healing, allowing the skin wound to heal, appears natural and function as it is designed for.

My previous two chapters touched on the design of the crease incision, where they are strategically placed so that it is in line with the biodynamics of the lid structure, the beveled plane to which the different layers of the eyelid is traversed, and the closure of the wound.

It is this author’s opinion that by distributing the surgical plane in a oblique(slanted) plane and performing the excision of tissue in a one-piece fashion, the wound reaction is lessened for these vulnerable layers. The control of minor bleeding is performed away from the immediate vicinity of the skin incision, the septum is opened further away from the skin wound, fat is preserved and the trapezoidal block excision allow more of the orbicularis than the skin to be excised. The upper skin incisional edge is then laid down in a relatively tension-free fashion prior to closure, and upon closure yields a perfect rotational point for the upper skin to fold over the crease as the eyelid fold. Similarly the trimming of a small sliver of excessive subcutaneous tissue along the inferior skin wound also permits tension-free closure.

(This is a partial sample of Chapter 12)
This chapter deals with the Author’s original finding of the natural tilt of the eyelid’s tarsal segment being at about 45 degrees when the eyelids are open. This often makes the vertical measurement of the crease height inaccurate. The vertical measurement of the crease height is underestimated and actually corresponds to its true anatomic crease height through a factor of $\sqrt{2}/1.0$ for a 45 degrees isosceles triangle, or 1.41 X. Inaccuracy in discussion and measurement of crease height are a major cause of suboptimal problems.
Proper understanding of the effect of the tarsal tilt and its effect on apparent crease height is critical for any practitioner contemplating eyelid surgery. The tarsal tilting reduces the apparent crease height as well as influence Caucasians and Asians’ anatomy differentially in normal state and various eyelid malpositions. Using hypothetical modeling as well as clinical examples, this chapter will relate the effects of this with respect to common errors seen in aesthetic upper blepharoplasty.

(Acknowledgement—The author wishes to acknowledgement the computer modeling and design work provided by Katherine L. Chen.)

Discrepancy between the Apparent crease height we observe versus the true Anatomic crease height:

We often see attendings at teaching institutions demonstrating to house staff the nuances of measuring levator function(excursion), by placing a millimeter ruler along the frontal vertical axis of the face and eyelid, perhaps at mid-section of the upper lid margin. The measurement of the crease height is often taken in a similar position. To get the true anatomic crease height, we should have that patient lying supine and measure the eyelid crease height with the lids closed; we then obtain the true anatomic scale of the crease height, which usually correspond to the vertical dimension of the tarsus centrally.

Asians: Take for example a natural 7 mm crease for an Asian upper eyelid. When the face is vertical and eyes are looking ahead, the crease is optimally manifested and tucked in under its eyelid fold. The superior tarsal platform is angled superoposteriorly in a tilted direction, close to a tilted Inclined angle (I) of 45 degrees. The tarsus therefore manifest tarsal tilt.
An accurately measured crease height of 7 mm (pretarsal skin) can be thought of as being aligned on the hypotenuse of a 45 degrees isosceles triangle, while the two remaining sides of this hypothetical triangle are the vertical axis and the horizontal axis (each of the two sides will be approximately $7\,\text{mm} \times 1/\sqrt{2}$, equaling 5 mm vertically and horizontally). Therefore a natural 7 mm crease will appear to the examiner as occupying 5 mm in vertical height from the most indented part of the crease to the eyelash margin (Inclined Crease height), and about 3 mm only if there is a 2-3 mm of eyelid fold overhanging it (or Apparent crease height). Therefore it is quite normal for a single eyelid patient to ask for a 3 mm crease for an end result; it is just that the practitioner should realize that it needs to come from a 7 mm anatomic crease placement.

Apparent Crease Height

$<$ Inclined Crease Height (Ich or Tch)

$<<$ Anatomic Crease Height.

or,

Anatomic Crease Height $>$ Inclined Crs Ht. $>$ Apparent Crs Ht.

implying that the design of a crease height is inherently higher, up to a certain anatomic boundary than what the patient observes or perceives.

The Apparent height of the Crease is less than the tilted crease height we see by the millimeters of overhanging lid fold.
(This is a partial sample of Chapter 20).
Chapter 6

Advanced: Effect of High Ankoring of Crease, Faden Effect, and of application of buried sutures

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This very advanced chapter deals with the Author’s current views regarding the practice of applying buried sutures to create or magnify an eyelid crease. An in-depth analysis of its adverse hindering effects is accompanied by two demonstration video clips.

Typical placement for buried suture method. Note that the front side under the skin is at the level for a proper crease (along the upper border of tarsus), while the backside under the conjunctiva is often at a higher point above the upper tarsal border as it ties up the levator (pink tissue layer).
It wasn’t that long ago that the proper way for plastic surgeons and eye surgeons to perform traditional upper blepharoplasty was to take off as much skin and fat as possible, and to apply a high crease fixation (Sheen, Flowers). The result is a sculpted look, with a prominent and showy pretarsal segment of skin along the lid margin, and a concave sulcus that stretched back towards the apex of the orbit.

This look eventually became less favored, when it became evident that there is a age-related spontaneous reduction of fat volume in the upper portion of the orbit (whether due to shrinkage or postero-inferior movement of fat). An often unnoticed side effect that ophthalmologists come across from these techniques, which utilized high fixation of crease on the lid, is that there seems to be a greater incidence of consecutive ptosis (droopy upper eyelid follows high fixation above the distal insertion of the levator aponeurosis). Therefore, empirically,

*High ankor of crease (wound closure) --- > consecutive ptosis.*

(Bear in mind that when I say high-ankoring, in my mind it applies to something that may be only 1-2 mm off norm. To me that is enough to cause a result to be less than ideal. Please see suboptimal results chapters and illustrations.)

This is akin to decreasing the contractile strength as well as the effective contractile length of levator along its 40 mms course from its origin at the orbital apex to its insertion at the lid crease. Is it strength or length that is affected? or both?

To understand this, ophthalmologists and house officers may recall learning how to do posterior fixation sutures (Faden procedure1-3) when trying to weaken the effective pull of medial rectus muscle in strabismus surgery, especially in large angle congenital esotropia, where children are born with severely crossed eyes. The idea is that by moving back from the insertion of the medial rectus muscle and placing an intrascleral stitch there (e.g. 3-5 mm posteriorly), one can further magnify the weakening effect of surgical recession of the extraocular muscle’s pull, the goal of strabismus repair for esotropia. Furthermore, mere placement of Faden posterior fixation suture (that is, placing them proximal to its insertion on the eyeball) *without* recessing the tendinous insertion of the medial rectus (by disinserting and reattaching it at a point further posteriorly) can mimic a recessional effect.

Tradition theories stated that this is due to a loss of effective arc rotation of the globe when the contact point is moved backward (proximally) resulting in a decrease in rotational efficiency, or that one has rendered the muscle’s rotation less effective through a decrease in contractile length, or through a tethering effect when segment of the muscle closer to the belly of it is attached to the globe.

Oculoplastic Surgeons also have experience in understanding that when the levator is deliberately recessed as a form of treatment in patients with retracted upper lids, there is lessened levator excursion as well as less crease indentation due to disinsertion of the aponeurosis. This can be enhanced with the interposition of spacer graft. The lessened levator excurs-
sion leads to a secondary ptosis, and is often protective to an over-exposed cornea.

Clark *et al* 4-7, through several published papers has demonstrated that there may be additional factors at play, including the rotational pulley effect where orbital tissues can be tethered when the medial rectus is incorporated towards the anterior muscle-orbital sheath (which invariably consists of fat and fibro-connective tissue septae) using a buried stitch, and duplicating the effect of Faden posterior fixation without having to apply any intrascleral stitch of Faden to the medial rectus muscle. He attributes the majority of the dampening effect of Faden as being due to a change in the surrounding orbital pulley rather than from a loss of effective arc contact of the muscle on the globe. The stitch initiates the change, while the change occurs in the tissues thus incorporated into the insertional end of the medial rectus (at its superior and inferior poles).

This is interesting because it showed that at least over the insertional end of a muscle like the extraocular muscle, traditional suturing underneath it towards the sclera of the eye (which I can refer to this as “endo-Faden”, or fixated to under layer), as well as suturing that same area of the extraocular muscle towards its surrounding soft tissue (orbital sheath and pulley mechanism, to which I will refer to it as “ecto-Faden”, fixated to adjacent or overlying layer), can each result in a decrease in net function of that muscle along its primary axis of action. Therefore, Faden (Endo- or Ecto-) can lead to weakening of pull of medial rectus.

This coincides nicely with the observation of secondary ptosis that we see in patients (whether Caucasians or Asians) who have had their crease placed in a higher than normal physiologic position. This is very likely from a decrease in net function of the levator muscle, when it is attached higher than a natural position.

The net decrease in levator function can be a combined effect of restrictive length of contraction with a high crease (placing stitching over the belly of the muscle, and closer towards its origin from the orbital apex is likely to incrementally affect the optimal length-tension point on the contractility curve of the muscle affected) as well as increasing the load (by adding tissue impedance) to its ability to lift the eyelid. This latter scenario comes from the levator portion bounded by the high crease now having to carry a greater load of tissues (lid margin, pretarsal segment of skin, orbicularis, tarsal plate and preseptal skin, muscle and aponeurosis below and bounded by this higher ankor). The patient often complains of heaviness of the lids. Eventually we see the levator wearing out and the lids develop ptosis. We can conceptually think of a high anchored crease as having an “ecto-Faden”, since the blepharoplasty closure stitch is often placed anteriorly, within the levator muscle’s distal portion.

We can see how a crease incision that is placed higher than normal, even if only a millimeter too high, can inadvertently lead to a restriction on the uplift.
The following is a simple demonstration (on right) involving two sheets of papers, several paper clips and paper scale. I try to show the impairing effect of having paper clips attached higher than the upper tarsal border, in analogy to buried sutures being applied through the distal aponeurotic part of levator. It is suitable for the reader who prefer not to watch surgical videos.

(This is a partial sample of Chapter 21.)