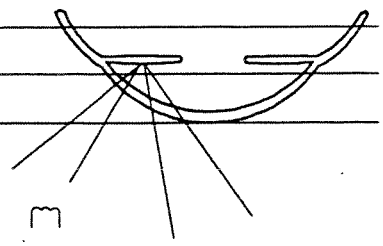
EXAM PREPARATION

FOR CONTACT LENS DISPENSERS

Part

4

Anatomical Considerations



PROPERTY OF
MANAGEMENT DEVELOPMENT

EXAM PREPARATION

FOR CONTACT LENS DISPENSERS

4: Anatomical Considerations

Copyright © 1991, 1993

Optical Training Institute

All Rights Reserved

No part of this book may be reproduced in any form without permission in writing from the Optical Training Institute.

Published By:

OPTICAL TRAINING INSTITUTE
4330 Barranca Parkway
Suite 101-129
Irvine, CA 92714
(714) 551-5455

1993

Introduction

Although Part 4 is entitled *Anatomical Considerations*, it might just as easily be called *Potentially Adverse Effects of Contact Lens Wear.* In effect, this section will catalogue many of the potentially negative aspects of contact lens wear. However, with diligence on the part of the fitter and compliance on the part of the patient, many of these adverse effects can be greatly minimized if not virtually eliminated. Proper patient selection, well-fit lenses, and adequate follow-up will usually result in healthy corneas and satisfied patients. However, lack of concern, laziness, or simple negligence on the part of either the fitter or the patient can often cause the sort of problems we're about to study. Detecting many of these conditions will often require considerable clinical experience, and treating them should always be left to the prescribing practitioner.

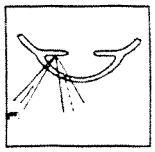
The section begins with a review of certain anatomical structures which effect the contact lens fitter. These include the tear film, eyelids, conjunctiva, cornea, and limbus. It is followed by a presentation of some of the potentially adverse effects of contact lens wear which include corneal edema, corneal striae, conjunctival and episcleral injection, giant papillary conjunctivitis, and corneal vascularization.

Flourescein, in addition to its value in helping to evaluate the fit of a contact lens, is also used to facilitate the precise delineation of specific corneal epithelial defects. It acts either by pooling in the area of the defect or by staining the underlying exposed basement membrane or Bowman's layer. Corneal epithelial staining patterns could possibly be caused by direct trauma or by defective distribution of the tear film. This section will illustrate staining patterns which might be caused by a poorly edged or damaged lens, or by improper insertion, removal and recentering techniques. We will also discuss staining which might be the result of defective tear distribution such as "three and nine-o-clock" staining, or limbal peripheral staining.

This section will conclude with a discussion of the biomicroscope or slit-lamp and will emphasize the importance of this instrument in contact lens fitting. The various illuminations are discussed, illustrated, and the uses of each are described.

The practice test consists of twenty-nine questions. As a reminder, be sure to study the material as thoroughly as possible before completing the test.

4: Anatomical Considerations



Anatomy Review

Anatomical & Physiological Considerations

Successful adaptation to any contact lens, either rigid or soft, is largely dependent upon the adequate wetting of both the lens and the cornea, and sufficient oxygen flow to the corneal epithelium. In addition, a stable and adequate tear film is required as well as some means of removing metabolic by products from the cornea. When there is an adequate tear volume, these requirements can be met with the eyelids.

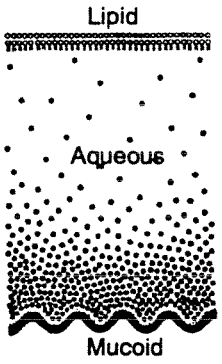
The health of the anterior surface of the eye is largely dependent upon the balanced interaction of several of its components. These include the eyelids, cornea, conjunctiva, sclera, and tear film. A contact lens on the eye can impose additional burdens to this system. If any one of the components are in some way altered, it can interfere with successful contact lens wear.

Tear Film–Three Layers



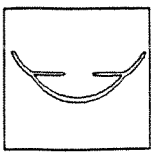
The taped discussion for Part 4 can be found on Tape 5, side 2. Simply follow along in the workbook as you listen to the tape for the first time. Then go over the material again to study it in more detail.

Lipid Layer: A fatty material produced by the meibomian glands which forms a very thin layer over the entire surface of the tear film. It functions primarily to prevent rapid evaporation which would result in dry areas on the cornea and subsequent discomfort and corneal damage.



The Mucoid Layer functions to convert the hydrophobic epithelial layer of the cornea to a hydrophyllic surface. It is the innermost layer of the tear film and located immediately against the corneal and conjunctival epithelial cells.
BUT or Break Up Time, indicates the amount of time it takes from a blink until the tear begins to break up or becomes discontinuous. BUT's shorter than 5-10 seconds are considered abnormal. Short BUTs may indicate a deficiency in the mucoid layer.

The Aqueous Layer is the middle layer of the tear film and consists of 98% water. However, it also contains ions, and other molecules such as sodium and potassium along with a concentration of protein.
A cornea is said to be *hypotonic* when more water flows in than out causing the cornea to swell. This occurs when normal evaporation is not allowed to occur. An isotonic cornea allows an equal amount of water to flow in as well as out allowing the cornea to maintain its normal thickness.



Anatomy Review

A normal cornea is in a continual state of partial dehydration which also known as *deturgence*. If more water flows out than flows in, the cornea becomes *hypertonic* resulting in corneal thinning. Hypertonicity can be caused by a higher salt concentration placed on the cornea. Another aspect of the tear layer which you may need to know is its pH, which refers to its relative acidity or alkalinity. The pH of the human tear is approximately equal to 7.4. pH will be menioned again in Part 6 when we cover contact lens solutions.

Eyelids:

The eyelids function primarily to help keep the eye moist and to help keep out foreign bodies. It is the opposing action of the eyelids which causes tears to spread evenly over the cornea thus keeping it moist. The lids play an important role in the fitting and wear of contact lenses for the following reasons:

They effect the wettability of the lens surface
They effect the positioning of the lens
They are sensitive and generally cause most of the discomfort when a lens is first placed on the eye

Conjunctiva:

The conjunctiva is the loose tissue covering the sclera and inside the lids. The *bulbar conjunctiva* covers the sclera while the *palpebral conjunctiva* is that portion which lines the inner surface of the upper and lower eyelids.

Cornea:

The cornea is the anterior refracting surface of the eye, it consists of transparent tissue and is devoid of blood vessels. The cornea is of utmost importance to the contact lens fitter since the lens sits directly on this tissue. The average corneal thickness is about 0.52 mm at its center and increases to about 0.65 mm at the limbal area and it is composed of five distinct layers.

Epithelium: That layer of the cornea which is exposed to the tears and comprises about 10 % of the total corneal thickness. The corneal epithelium is highly regenerative, demonstrating a remarkable ability to heal itself after being scratched. A corneal abrasion is often completely healed within 24 hours.

Bowman's Membrane: Is essentially a modification of the underlyhing stroma. Unlike the epithelium, if damaged by a scratch or cut, it can not regenerate itself so scarring will occur.

Stroma: The stroma comprises approximately 90% of the corneal thickness. It consists of 200 to 250 layers of cells called lamellae, which lie parallel to the corneal surface. If damaged by injury, scarring will occur which can result in opacities of the cornea.

Chronic infection or corneal edema can cause blood vessels to invade the stroma resulting in a condition known as *neovascularization.*. These blood vessels which enter to supply oxygen and nutrients can obscure vision.

Descemet's Membrane:: A strong structureless layer which is secreted by the endothelium. It is elastic, and resistant to trauma and pathology.

Endothelium: The innermost or most posterior layer of the cornea, consisting of a single layer of flattened cells. In contrast to Descemet's Membrane, these cells are very susceptible to trauma and pathology. And in marked contrast to the epithelium, endothelium cells are infrequently, if ever replaced as a normal process during adult life. If disrupted, however, they can be replaced by the spreading of healthy cells.

Limbus:

The limbus is a transition zone between the cornea and the sclera. It is approximately 1 mm wide and the cornea is dependent upon it for receiving part of its nutrients. The limbal region becomes significant when fitting contact lenses since it is so closely connected to the cornea and some contact lenses will bear directly on it.

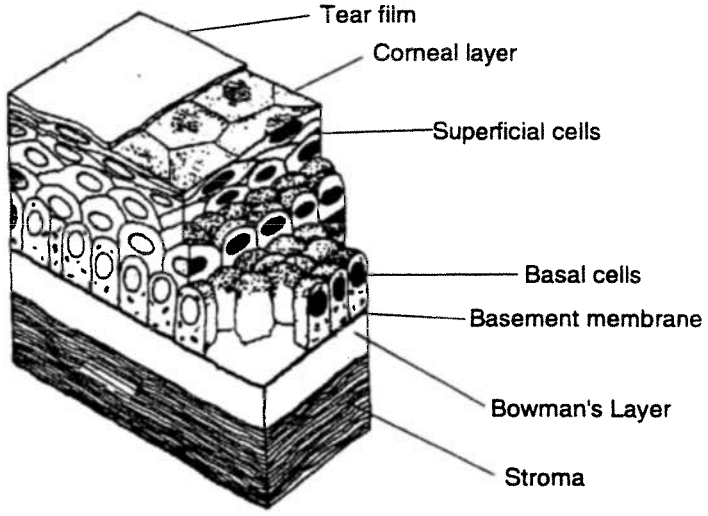


Diagram Of Corneal Epithelium

Adverse Effects

Corneal Edema:

When the combination of forces which normally serve to dehydrate the cornea are overcome by forces which drive water into the cornea, corneal edema may result.

This situation, which may be induced by contact lens wear when the corneal epithelium becomes deprived of its normal amount of oxygen, is known as *corneal hypoxia.* When PMMA lenses are worn, the amount of oxygen received by the cornea is dependent upon the adequate circulation of tears under the lens. An inadequate tear flow under the lens can result in corneal edema.

Corneal edema with PMMA lenses may be caused by the following factors:

Abnormalities in the tear film
A tight fitting lens
An excessively large lens
Poor blinking habits
Inconsistent or excessive wearing time

Corneal edema with rigid gas-permeable lenses:

In rigid gas permeable lenses corneal edema can be caused by all of the factors as in PMMA lenses but only if there is inadequate transmission of oxygen through the lens. This can occur if the surface of the lens is coated extensively with deposits.

Corneal edema with soft lenses:

Any factor which limits the transmission of oxygen through the lens can result in corneal edema with soft contact lenses. Some of these factors might include:

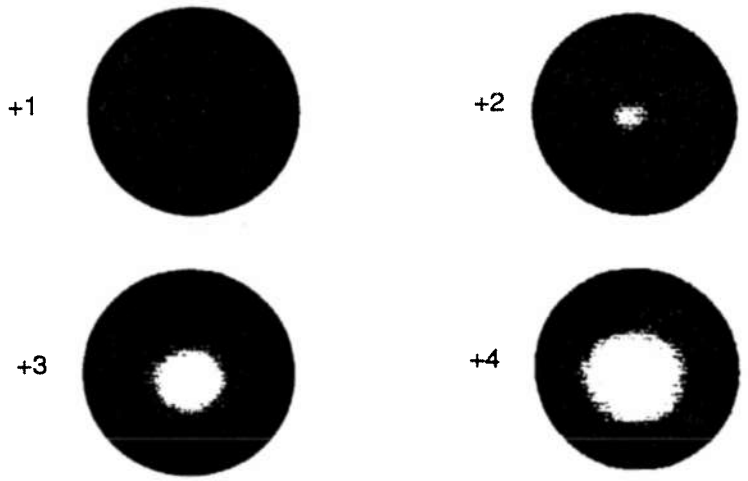
Inadequate lid closure
Excessive lens thickness
Relatively low lens water content

The interrelationship of these three factors becomes especially important when fitting extended-wear lenses.

Adverse Effects

Corneal Epithelial Edema

This condition appears as a grey corneal have and may be best observed with a slit lamp *utilizing sclerotic* scatter illumination and the unaided eye. The various slit lamp illuminations will be covered later in this section.

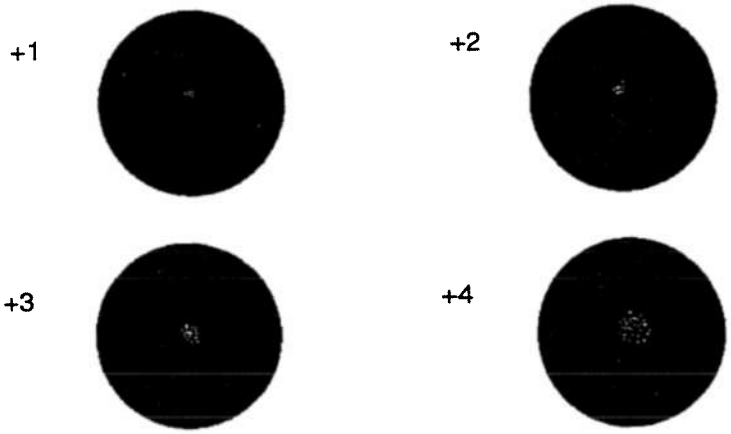


The severity of epithelial may be noted by grading it from +1, a barely perceptible haze to +4, which is a densely circumscribed area.

Adverse Effects

Microcystic Edema

Progressive corneal hypoxia can lead to the rupture of certain epithelial cell membranes which in turn can result in the formation of microcysts. Microcysts are the result of fluid which has accumulated in the spaces caused by the rupture of these cells. Microcystic edema is best seen utilizing a slit lamp with *retro-illumination.* Flourescein can also be used to outline intact microcysts and stain the punctate areas where microcysts have ruptured.



The illustration above depicts the gradation of contact-lens-induced corneal epithelial microcystic edema. Typically this edema is centrally located. The mycrocysts are frequently interspersed with punctate epithelial defects which result from microcyst rupture.

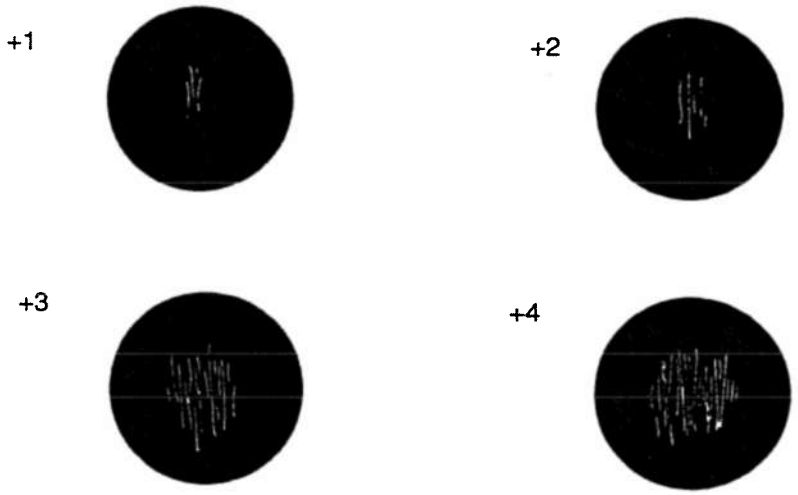
Adverse Effects

Corneal Striae

Corneal striae are linear opacities in the cornea. They may also be referred to as striae, folds, wrinkles, striate keratopathy, striate corneal lines. The terminology is ambiguous.

These are seen as vertically oriented, delicate, translucent lines located at or near the level of Descemet's membrane. Corneal straie are best seen either with retroillumination or with direct illumination.

They are found in up to 50% of soft lens wearers but are very rare in rigid contact lens patients. The reason for this is not completely understood.



Contact-lens-induced corneal striae are shown above graded from +1 to +4. They are quite subtle and can be easily overlooked. Typically they are slender, vertical, and occur in the pre-Descemet's region of the stroma.

Adverse Effects

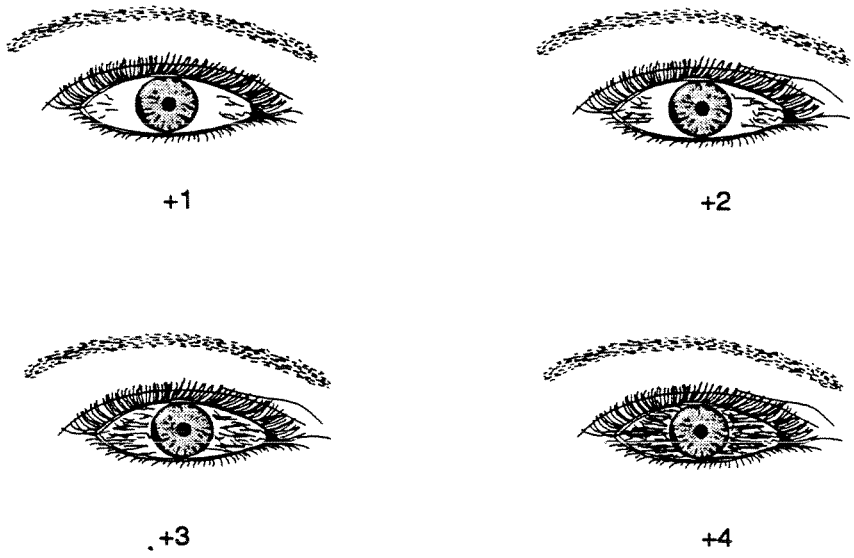
Conjunctival and Episcleral Injection

Episcleral injection is a nonspecific manifestation of an inflammation of the conjunctiva. It occurs when the conjunctival vessels become "red." Contact lens wear can be the cause episcleral injection in the following circumstances:

The result of allergic or toxic reactions to various contact lens solutions.

Infectious conjunctivitis, although this is generally coincidental and is rarely due to contact lens wear.

Alterations in the integrity of the corneal epithelium which can be caused by direct trauma or by exposure related hypoxia and dessication.

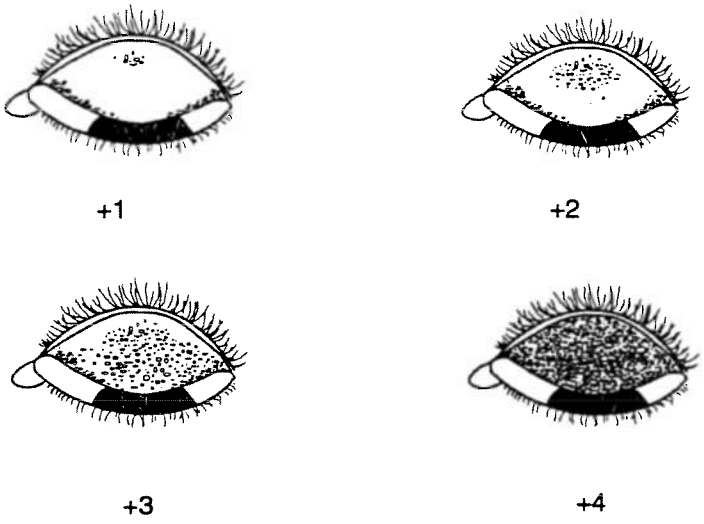


Episcleral injection may be graded according to its degree of severity as shown above. The vessels are concentrated in the perilimbal area and are dusky red in color.

Adverse Effects

Giant Papillary Conjunctivitis

GPC is a nonspecific response to a conjunctival insult. It results in the formation of papillae on the palpebral conjunctiva. A papillae is a small conjunctial elevation. It is seen most frequently in soft contact lens wear and only rarely with hard lenses.



Giant papillary conjunctivitis is divided into four stages of severity according to the number, distribution, and size of the papillae.

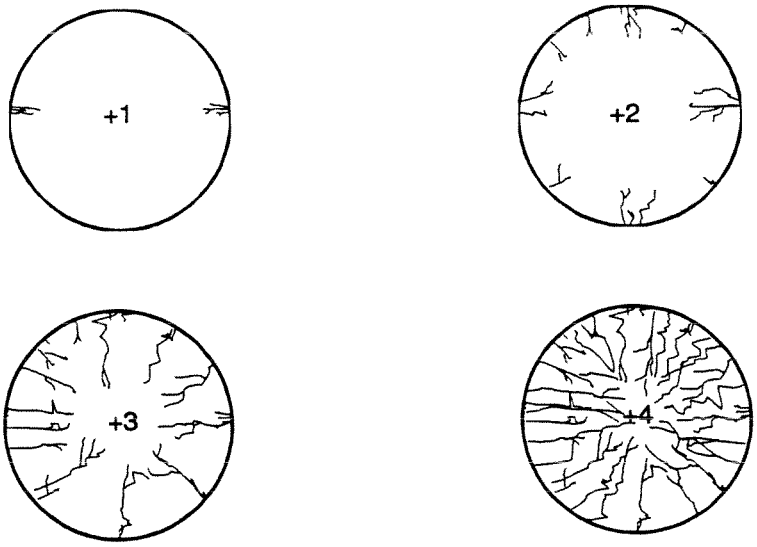
Adverse Effects

Corneal Vascularization

The invasion of blood vessels into the cornea is known as conreal vascularization. It may occur as the result of epithelial infection, degenerations, exposure to toxins, noninfectious inflammatory conditions, hypoxia, or trauma.

In addition, vascularization may be induced by contact lens wear in the following circumstances.

Persistent epithelial hypoxia
Recurrent epithelial defects
Surgical, traumatic, or other pathological condition for which a contact lens is worn



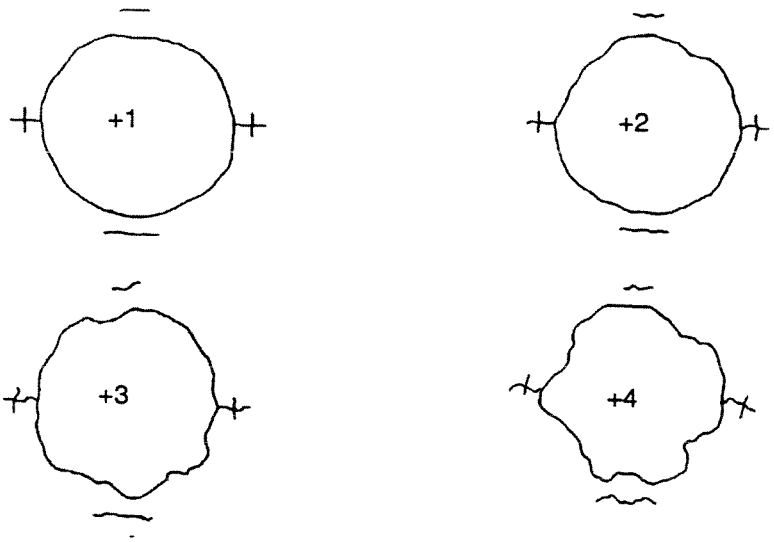
The extent of vasclarization is measured according to number of vessles which have invaded the cornea. In grade +1, only a small number of vessels are noted in the corneal periphery and are ingrown no more than 2 mm from the limbal area. In grade +4, the vessels come in from all directions and begin to cover the geometric center of the cornea.

Adverse Effects

Keratometer Mire Distortion

Irregular astigmatism or apecal displacement may be indicated by distorted keratometry mires.

Contact lens wear has been associated with alterations in corneal topography. These changes can be intentional such as in the case of orthokeratology. Preocular tear film abnormalities can also result in distorted keratometer mires.



The distortion of keratometry mires may be graded as shown above. Grade +1 shows only a minimal loss of mire regularity, whereas in grade +4 mire regularity and clarity is severly altered. In these instances, keratometry readings are very innacurate.

Staining Patterns

Corneal Epithelial Staining Patterns

The loss of corneal epithelial cells is one of the most common adverse consequences of contact lens wear. Although this can be detected through the use of the slit lamp, the installation of flourescein dye can indicate the precise nature and location of specific corneal epithelial defects. Flourescein acts either by pooling in the area of the defect or by staining the underlying exposed basement membrane or Bowman's layer.

Corneal epithelial damage can result in the discrete loss of a few epithelial cells to deeper craterlike lesions with cell loss to the level of Bowman's membrane. Epithelial damage can be caused either by direct trauma or by defective tear film distribution over the cornea.

Epithelial Defects Induced by Direct Trauma:

1. A poorly edged or a damaged lens
2. An excessively flat lens
3. Foreign particles such as dust or cosmetics which lodge beneath the lens
4. Improper insertion, removal and recentering techniques
5. Poor cleaning habits
6. Mucus build-up generally due to the dry storage of hard lenses

---

Figure A to the right illustrates a swirl-like stain, semicircular in configuration. Possible causes are keratoconus associated with apical touch, a flat lens-cornea relationship, or a poorly centered lens.

Figure B illustrates foreign body stains which can leave either a thin snakelike track on the cornea as it travels under the lens or a small crater-like lesion as the result of becoming embedded in the cornea. The most common foreign matter to be trapped under the lens is dust, followed by eye makeup and mucus particles.

A





B

Adverse Effects

Deposited mucus not cleaned from the back of the lens or scratches on the back of the lens can cause discomfort and scratch-like stains on the cornea as illustrated in figure A to the right.



A

Figure B shows a fatigue stain which has a dull, hazy appearance. Subtle folds or wrinkles can accompany it. This condition is most frequently observed in long-term contact lens wear. Other possible causes are a large lens, flat lens, unmoving lens or high riding lens.



B

The arc stain shown in figure C is crescent-shaped, and is most often superficial. It can possibly be caused a poorly designed hard contact lens edge, insufficient peripheral and intermediate posterior curves, dried mucus near the edge, a scratched edge, or peripheral or intermediate posterior curves, a poorly centered soft lens with a wrinkled edge. Correction of this problem usually requires modification in lens design or fit.



C

Figure D represents a re-centering stain which is arc shaped
and linear caused by the edge of a hard contact lens. It can be one or several unbroken stains that to not recur unless the lens continues to get displaced. Other possible causes are a flat lens, and too much and too flat a peripheral posterior curve..



D

Adverse Effects

Epithelial Defects Induced by Defective Tear Film Distribution

Defective tear film distribution can be due either to abnormalities in the quantity or composition of the tear film or by blinking problems such as a decreased blink rate or "false" blinking. Such conditions can lead to corneal exposure and drying, or to corneal hypoxia under the contact lens, or both.

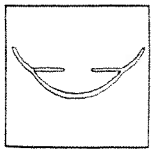
1. Desiccation or drying of the corneal epithelium around the periphery of the lens, especially at the 3 and 9 'clock. Movement of the lens over these areas can dislodge the compromised epithelial cells.
2. Hypoxia, (oxygen deprivation) under the lens due to inadequate tear flow can lead to the development of microcysts. When these rupture or are abraded, defects will result.
3. Corneal edema resulting from chronic hypoxia can alter the corneal contour and thereby reduce the normal clearance between the cornea and the posterior lens surface. Epithelial defects can then result from the lens movement over these areas.



A B

Figure A above illustrates limbal peripheral staining at 3 and 9 o'clock.

Figure B shows a 360 degree peripheral stain. It may possibly be caused by a small diameter soft lens, a lens edge which is dehydrated or wrinkled, a damaged lens edge, or dried mucus or other lens deposits.



Adverse Effects





Dry spots are illustrated in figure A above These are areas of the cornea which appear dark rather than stained and retain their configuration during blinks. Possible causes include a poorly lubribaced eipthelium resulting from a healing abrasion, a recurrent abrasion, or kerititis sicca (dryness of the cornea).

Figure B shows epithelial depressions. Air bubbles trapped beneath a lens produce a series of round depressions in the epithelium. Normally there is no break in the eipthelium and within minutes of removing the lens, the depressions disappear.

A diffuse punctate staining pattern can be caused by toxic epithelial injury. It can be the result of from wetting, cleaning, and storage solutions or eye drops. Other possible causes are chlorine (swimmer's eye) or atmospheric conditions such as toxic pollutants.

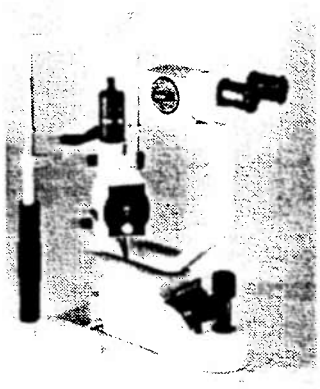
Figure C shows a chemical stain where the cornea appears to have a hazy surface due to numerous punctate stains and microcysts which cover the entire cornea to the limbus.



C

Slit Lamp

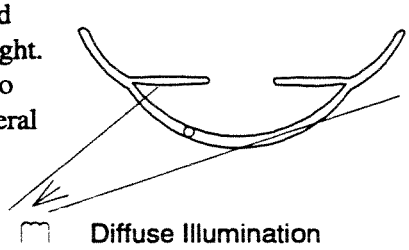
The slit lamp or biomicroscope is an instrument designed primarily to observe the transparent structures of the human eye under a magnification of from 10 to 50 times. Its two principal parts include as lamp equipped with an optical system designed to project a slit of light upon the eye, and a stereomicroscope which is mounted horizontally for direct viewing of the patient's eye. The slit lamp may be adjusted to project a variety of light beams. By varying the light beam and the viewing position, it is possible to improve the view of the various structures of the eye.



Slit-Lamp Biomicroscope

Since the biomicroscope is particularly useful for examining the cornea it plays an especially important role in the fitting of contact lenses. Symptoms of a poor fitting contact lens, for example, can usually first be detected through the use of the slit lamp.

Diffuse Illumination: A wide beam of light is directed obliquely at the cornea with no attempt to focus the light. It provides a good over all picture of the cornea but no fine details can be seen. It is used primarily for a general survey of the eye.



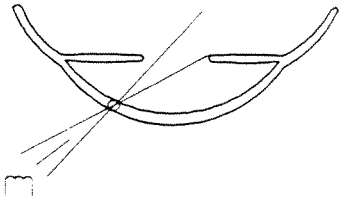
Diffuse Illumination

Uses:

The extent of a corneal scar or infiltration can be observed along with the presence of folds or straie in Descemet's membrane. Corneal edema may be seen as a hazy grey, somewhat granular appearance.

Slit Lamp

Direct Focal Illumination: The microscope and the beam of light are focused on the same area.There are three types of direct focal illumination: 1) optic section, 2) parallelepiped, and
3) conical beam.



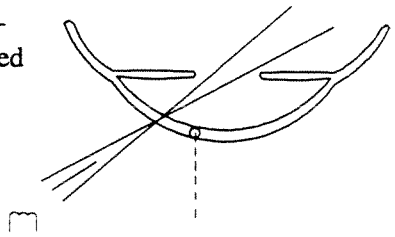
Direct Focal Illumination

Optic section is used to see all layers of the cornea. With it, it is possible to determine distortions in the corneal contour and the depth of foreign bodies.

Parallelepiped provides a broader view of the anterior and posterior corneal surfaces. It is used to help assess any surface irregularities which may exist and to examine the endothelium. It is often used with flourescein in helping to determine the fit of a contact lens.

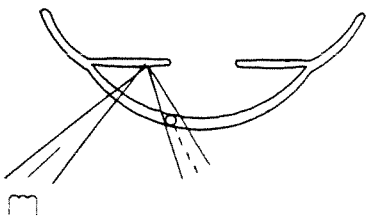
Conical Beam is the most sensitive method for observing flare or relucency in normal aqueous humor in the anterior chamber. Using high magnification it resembles light penertating fog.

Indirect Illumination: The observer focuses the microscope on an area immediately adjacent to the illuminated postion. It is particularly valuable for studying the iris for pathology.



Indirect Illumination

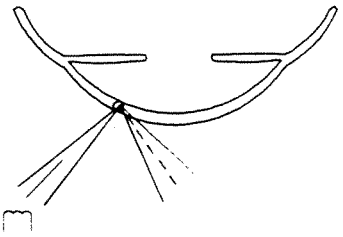
Retro Illumination: The light is focused on the deeper structures such as the iris, lens or retina while the microscope is focused to study the more anterior structures in the reflected light. Most typically, the light is reflected from the iris in order to study the cornea.
It can be useful for the examination of corneal edema and to view blood vessels that have invaded the cornea. It can also be used to study deposits on Descemet's membrane.



Retro Illumination

Slit Lamp

Specular Reflection: The illulminating arm and the microscope are postitioned such that the beam of light, when reflected from the corneal surfaces, will pass through one of the oculars of the microsope. At this point the angle of incidence of the light will ge be equal to the angle of reflection.

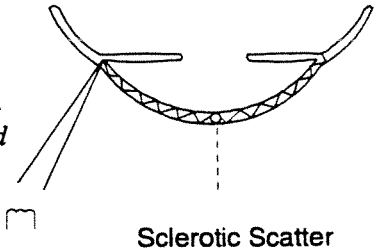


Specular Reflection

It is used for observing elevation and depressions of the anterior surface of the cornea or a soft contact lens. It may also be used to observe lipid or calcium deposits on contact lenses and their general wetting condition.

This form of illumination can also be used to observe the pre-corneal tear film to include mucus and meibomian secretions.

Sclerotic Scatter: A broad beam of light is focused at the temporal limbus so it transilluminates through to the nasal limbus. The microscope is then focused sharply on the cornea. *Sclerotic scatter and the unaided eye is used to detect the presence of corneal edema* which appears as a foggy patch of cotton.



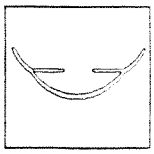
Sclerotic Scatter

Cobalt Blue Filter: A cobalt blue filter is often used after the instillation of flourescein to observe staining patterns and lens fit.

White Filter: Used to decrease ultraviolet rays and minimally decrease light intensity. It is used primarily for routine examination.

Neutral Density Filter: Decreases light intensity about 10%. Used to examine eyelids and conjunctiva. Useful for photophobic patients.

Green Filter (red free): Makes red or brown objects blacker. Useful for observing blood vessels.



Practice Test



The practice test for part 4, Anatomical Considerations, will be reviewed on Tape 6, side 1. Before taking the test be sure to understand the material covered as thoroughly as possible.

___1. The eyelids play an important role in the fitting and wear of contact lenses for which of the following reasons?

a. they effect the wetability of the lens surface
b. they effect the positioning of the lens
c. they are sensitive and generally cause most of the discomfort when a lens is first placed on the eye
d. all of the above

___2. Small punctate stains on the corneal epithelium when seen under an ultraviolet light are most likely caused by:

a. foreign bodies
b. loose lenses
c. tight lenses
d. apical clearance lenses

___3. After about four hours of wear, your patient complains that his eyes feel "hot." This may be an indication of:

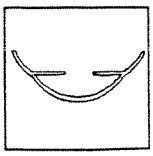
a. too small a lens
b. too large a lens
c. too loose a lens
d. too tight a lens

___4. Three and nine o'clock staining is generally seen with:

a. soft lenses
b. rigid PMMA lenses
c. gas permeable lenses
d. fourocarbon lenses

___5. A rigid gas permeable contact lens is causing a slight stagnation of tears over the corneal apex. One possible lens modification might be:

a. to reduce the base curve radius
b. to reduce the lens diameter
c. to increase the lens diameter
d. to fenstrate the lens



Practice Test

___6. When the fitter observes the occurrence of neovascularization, the first course of action should be:

a. return the patient to the prescribing 54practitioner
b. recommend a different lens material
c. increase the lens diameter
d. truncate the lens

___7. The slit lamp illumination most commonly used for detecting corneal edema is:

a. cobalt light
b. direct focal illumination
c. sclerotic scatter and the naked eye
d. conical beam

___8. Limbal peripheral staining may indicate the possibility of:

a. cataracts
b. corneal vascularization
c. a retinal detachment
d. giant papillary conjunctivitis

___9. When an adapted contact lens patient manifests significantly increased scleral injection it would indicate:

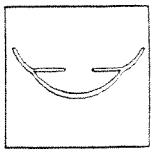
a. the need for medical attention
b. a normal condition
c. toric lenses may be required in time
d. a condition that will clear in time

___10. During a slit lamp evaluation, a hazy cornea is an indication of:

a. a well fit lens
b. a corneal ulceration
c. corneal edema
d. a loose fitting lens

___11. Focusing the beam of the slit lamp directly on the limbus and observing the cornea without the use of the microscope is an excellent way to observe:

a. epithelial erosion
b. the lens cornea relationship
c. pathology of the iris
d. diffuse epithelial edema



Practice Test

___12. Superficial punctate staining at the corneal apex combined with edema in this region might indicate:

1. a steep fit
2. a flat fit
3. overwearing

a. 1 only
b. 3 only
c. 1 and 2 only
d. 1, 2, & 3

___13. Corneal staining as observed with a slit lamp may be caused by which of the following:

1. a foreign body
2. poor insertion techniques
3. poor edge design

a. 1 only
b. 3 only
c. 1 & 2 only
d. 1, 2, & 3

___14. A significant foreign body stain is observed on the cornea during the prefitting evaluation. Which of the following should the fitter do?

a. fit a bandage lens
b. fit a gas permeable lens
c. fit a soft lens
d. consult the prescribing practitioner

___15. During a slit lamp evaluation certain areas of the cornea are observed which appear dark, retain their configuration during blinking, and do not stain. These areas most likely represent:

a. dry spots
b. microcystic edema
c. neovascularization
d. a corneal ulceration

Practice Test

___16. The average pH of the human tear is:

a. 10.0
b. 7.8
c. 7.4
d. 6.6

___17. A long time successful wearer of gas permeable silicone acrylate lenses presents with superficial punctate keratitis, but complains of no visual problems. The most likely cause is:

a. overwearing
b. protein buildup on the lens
c. scleral injection
d. GPC

___18. Punctate staining is generally the result of:

a. inadequate tear exchange
b. a poor edge design
c. compression of the lens on the cornea
d. corneal dehydration

___19. Prolonged corneal edema can result in:

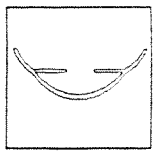
a. photophobia
b. limbal injection
c. excessive spectacle blur
d. all of the above

___20. Stippling can result when there is:

a. inadequate tear exchange
b. too flat a lens
c. too large a lens
d. too small a lens

___21. An arc shaped stain can be caused by:

a. lens compression on the cornea
b. inadequate tear exchange
c. dellen
d. a poor edge that is not well rounded



Practice Test

___22. Corneal vascularization is most likely to occur with:

a. gas permeable lenses
b. soft lenses
c. PMMA lenses
d. bandage lenses

___23. _____is not considered to be a normal adaptive symptom of rigid lenses.

a. photophobia
b. tearing
c. lid sensation
d. punctate staining

___24. Corneal vascularization induced by contact lens wear can be caused by:

1. dellen
2. irregular astigmatism
3. recurring and persistent epithelial hypoxia
4. recurring epithelial defects

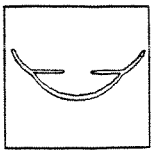
a. 1 & 2
b. 1, 2, & 3
c. 2 & 4
d. 3 & 4

___25. A slit lamp is focused on one of the deeper structures of the eye such as the lens or iris while the microscope focuses on the more anterior structures in the reflected light. This illumination is known as:

a. specular reflection
b. sclerotic scatter
c. direct focal illumination
d. retro illumination

___26. Following the installation of flourescein it is sometimes useful to use the _____filter of the slit lamp to observe staining patterns.

a. neutral density
b. green
c. cobalt blue
d. white



Practice Test

___27. The invasion of new blood vessels into the cornea is known as:

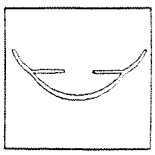
a. deturgence
b. keratitis sicca
c. neovascularization
d. bullous keratopathy

___28. Conjunctival and episcleral injection can be caused by:

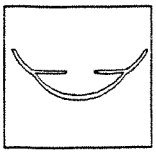
a. toxic reactions to various contact lens solutions
b. infectious conjunctivitis
c. alterations in the integrity of the corneal epithelium caused by direct trauma
d. all of the above

___29. When using flourescein to aid in the evaluation of the fit of a rigid lens fit, a special filter must be used with :

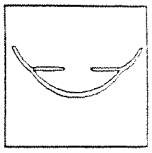
a. PMMA
b. Fluorocarbon
c. HEMA
d. Silicone acrylate



Notes



Notes



Notes