Solving the problem of the red eye

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Abstract
This software is designed to aid the clinician and the student in the differential diagnosis and treatment of a red eye. The program, consisting of three disks, was designed with HyperCard v. 1.2.5 for the Macintosh computer. Included in the program are objective and subjective findings, diagnostic tests, suggested treatment regimens and any contraindications, follow-up care and prognosis for forty-five etiologies of a red eye. One of the major features of this program allows the clinician to enter subjective and/or objective findings. Given these findings, the computer will provide a list of possible ocular conditions. From this list, the clinician can select one of the possibilities listed in which he/she feels is most appropriate for that particular patient. At this point the program will proceed to a stack of information specific for the selected condition. Once a choice has been made, the clinician always has the freedom of returning back to the list of possible ocular conditions.

Degree Type
Thesis

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SOLVING THE PROBLEM OF THE RED EYE

by

Jay M. Haynie, B.S.
Kenneth D. Ridder, B.A.

A thesis submitted to the faculty of the
College of Optometry
Pacific University
Forest Grove, Oregon
for the degree of
Doctor of Optometry
April, 1992

Faculty Advisors:

Craig E. Bowen, O.D.
Salisa K. Williams, O.D.
SOLVING THE PROBLEM OF THE RED EYE

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Salisa K. Williams, O.D.
Biographies

Jay M. Haynie received his B.S. in Visual Science from Pacific University, Forest Grove, OR in 1989. He is a candidate for an O.D. degree at Pacific University College of Optometry in May of 1992. He has been a member of Beta Sigma Kappa, Phi Theta Epsilon, and Phi Theta Kappa during his college career. He has currently been selected to the residency program at American Lake Veterans Hospital in Tacoma, WA. Upon completing the residency program, his future plans are to enter private practice in Olympia, WA.

Kenneth D. Ridder received his B.A. in EPO Biology from the University of Colorado, Boulder in 1988. He is a candidate for an O.D. degree at Pacific University College of Optometry in May of 1992. He has been a member of Beta Sigma Kappa, Phi Theta Epsilon, and Phi Theta Kappa during his college career. His future plans include practicing in a group practice or partnership in Colorado or Oregon.

Craig E. Bowen, O.D. received his Bachelor of Science degree from Alma College, Alma MI. He received his doctorate in Optometry from Pacific University College of Optometry in 1986. Clinical Professor of Optometry from 1989 to present. He has a private practice in Tualitin Oregon.

Salisa K. Williams, O.D., a graduate of Northeastern State University College of Optometry, is an Assistant Professor at Pacific University College of Optometry with primary emphasis in the areas of ocular disease and pharmacology. Prior to assuming her current position at Pacific University College of Optometry, Dr. Williams worked in hospital and primary care clinic settings in Alaska and Nevada while employed by Indian Health Service. She maintains affiliations with numerous professional associations. She has presented continuing education throughout the Western United States and is a past recipient of the American Public Health Association's prestigious award for an outstanding paper and project.
Abstract

This software is designed to aid the clinician and the student in the differential diagnosis and treatment of a red eye. The program, consisting of three disks, was designed with HyperCard v. 1.2.5 for the Macintosh computer. Included in the program are objective and subjective findings, diagnostic tests, suggested treatment regimens and any contraindications, follow-up care and prognosis for forty-five etiologies of a red eye. One of the major features of this program allows the clinician to enter subjective and/or objective findings. Given these findings, the computer will provide a list of possible ocular conditions. From this list, the clinician can select one of the possibilities listed in which he/she feels is most appropriate for that particular patient. At this point the program will proceed to a stack of information specific for the selected condition. Once a choice has been made, the clinician always has the freedom of returning back to the list of possible ocular conditions.
Acknowledgements

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We would also like to thank Dr. Bowen, Dr. Salisa Williams, Dr. Steven Rogers, Dr. Edward Zayac and Dr. William Shreck for taking the time to proofread and offer their suggestions to our project.
List of conditions covered in this program

Acute Angle Closure Glaucoma
Acute Interstitial Keratitis
Allergic Conjunctivitis
Anterior Uveitis
Bacterial Conjunctivitis
Blepharitis
Canaliculitis
Chemical Burns
Chlamydial Conjunctivitis
Conjunctival Foreign Body
Contact Dermatitis
Contact Lens Related Etiologies
Corneal Abrasion
Corneal Foreign Body
Corneal Ulcer
Entropian
Epidemic Keratoconjunctivitis
Episcleritis
Exposure Keratopathy
Filamentary Keratopathy
Floppy Eyelid Syndrome
Giant Papillary Conjunctivitis
Herpes Simplex Keratitis
Herpes Zoster Ophthalmicus
Hyperacute Bacterial Conjunctivitis
Keratoconjunctivitis Sicca
Ocular Pemphigoid
Ocular Rosacea
Orbital Cellulitis
Parinaud's Conjunctivitis
Phlyctenulosis
Pterygium
Recurrent Corneal Erosion
Scleritis
Stevens-Johnson Syndrome
Subconjunctival Hemorrhage
Superficial Punctate Keratopathy
Superior Limbic Keratoconjunctivitis
Thermal / UV Keratopathy
Trachoma
Traumatic Iritis
Trichiasis
Vernal Conjunctivitis
Viral Conjunctivitis
Differential Diagnosis of a Red Eye

by
Kenneth Ridder
&
Jay Haynie

Craig E. Bowen
&
Salisa K. Williams
as Advisors
Differential Diagnosis of a Red Eye

List of Conditions Covered in this Program
This software is designed to aid both the student and the clinician in the differential diagnosis of a red eye. There are four main sections to this program:

- Main Menu
- A list of all conditions covered in the program which are separated by tissue involved. This can serve as a menu to rapidly go from disease to disease.
- Differential Diagnosis: By entering signs and symptoms, the computer will come up with a "List of Possibilities".
- 45 Disease Stacks: These stacks contain information about each condition including treatment and follow-up.

Since ocular conditions do not always present with the same signs and symptoms, we have programmed each condition with the TYPICAL signs and symptoms. As students, we have limited clinical experience and have relied heavily on textbooks and our advisers for the information contained in this project.

We have tried to be as specific as possible in describing the management of those conditions that are commonly treated by optometrists in states with therapeutic laws. Our treatment regimens are general for those conditions that are best treated by other healthcare professionals. Keep in mind that most therapeutic modalities described here are not the only way to treat that particular condition but are ones that were commonly given in the references we used. Therefore, they are guidelines and not absolutes. It is beyond the scope of this program to list all contraindications and side effects of drugs listed here. Please consult the Physicians Desk Reference if questions exist and to keep abreast of revised recommendations.

We realize that with a project of this magnitude and our limited clinical experience, that errors and omissions may exist. Again we have strived to be as complete and concise as possible, but we recommend that you use this only as a guide and not as the sole source in treating conditions, especially those that you are not familiar with treating. Therefore, we do not imply or accept professional liability for treatment of those conditions included in this software.

Although every possible cause for a red eye has not been included, we hope that this program is helpful to all that use it, and we welcome any suggestions or corrections so that we can include them in the next version.

Sincerely,

Kerrice Butler

Credits/References

How to use this program
Credits/References

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• Williams, Mark and Pepe, Alex Class Handouts Opt. 603 Pacific University Fall 91
  - Red Eye Work up Alex Pepe
  - Ocular Trauma Alex Pepe
  - Viral Ocular Disease Mark Williams
• Williams, Salisa Class Notes Therapeutic Pharmacology, Pacific University Spring 91
• Selected articles from Review of Optometry
• Selected articles from Journal of Ophthalmology
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References Used

Jay Haynie

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Phlyctenulosis
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Viral Conjunctivitis
Chlamydial Conjunctivitis
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Bacterial Conjunctivitis
Trichiasis
Entropian
Sub Conjunctival Hemorrhage
Pterygium
Epidemic Keratoconjunctivitis
Trachoma

Authoring

Kenneth Ridder

DDx of Red Eye (Introduction)
Differential Diagnosis 3.01
Corneal Abrasion
Corneal Ulcer
Anterior Uveitis
Acute Angle Closure Glaucoma
Scleritis
Chemical Burns
Corneal Foreign Body
Conjunctival Foreign Body
Superficial Punctate Keratopathy
Filamentary Keratopathy
Recurrent Corneal Erosion
Thermal/UV Keratopathy
Herpes Zoster Ophthalmicus
Herpes Simplex Keratitis
Acute Interstitial Keratitis
Superior Limbic Keratoconjunctivitis
Episcleritis
Orbital Cellulitis
Contact Lens Related
Traumatic Iritis
This program is set up in the following manner. Navigation between screens is accomplished by "clicking buttons". Click the arrow in the bottom right hand corner of the screen.

![Diagram](image-url)

Main Menu
- Instructions
- List of Conditions
- Differential Diagnosis
- Quit

- Credits
- References
- General Red Eye Work up

- List of Possibilities
- "Disease Stacks"

- Signs/Symptoms
  - Work up
  - Treatment
  - Follow up
Below are some examples of buttons used on the "Menu Cards" for each disease. Click on "Diagnosis" under the Menu below.

![Diagram of a menu card with options for diagnosis, signs, treatment, and follow-up]

All of these buttons will take you to a corresponding screen....

![Diagram of a menu card with additional options like more buttons, differential dx, and main menu]

.. or give additional choices to pick from.
Below is an example of what the "Differential Diagnosis" card looks like. To begin, you must decide if pain is to be included in the differential, and if so to what degree. "Click" one of the buttons below.

![Differential Diagnosis](image)

Below are more examples of other buttons used in this program. Some will "auto hilite" and some will not. Click the button "No Pain"

- No Pain

Buttons like this are used to enter in signs/symptoms.

- Start again
- Hide
- To Menu

These buttons perform specific functions.

- Back to "List of Possibilities".
- To Quit program
- Gives additional information.
- Takes you to "List of Conditions" covered in this program.
- Takes you back to the previous screen.

Return
Below is an example of what the "Differential Diagnosis" card looks like. To begin, you must decide if pain is to be included in the differential, and if so to what degree. "Click" one of the buttons below.

Then click on the appropriate buttons to enter the signs and symptoms to be included in the differential diagnosis.

- photophobia
- burning
- itching
- blurred vision
- chemosis
- follicles
- high IOP
-外国 body sensation"
- "tearing" in this program is the same as "watery discharge"
- "purulent discharge" is any type of discharge other than watery discharge.
- "Blurred vision" must be caused by the red eye in order to include it as a symptom. Best refraction and/or pinhole acuites to rule out refractive error.
- "Headaches" is the same as "headache type pain" and must be connected with the red eye.
- "Halos" are generally secondary to corneal edema.
- Anterior chamber reaction is the same as "Cells and Flare"
The "Diagnose" and the "Start Again" buttons are two important buttons on this card. Click each one for more specific information.
There are two times when you would use this button:

- Obviously if you wanted to start over with a new set of signs or symptoms, this button will erase all of the previously checked signs and symptoms.

- If you make a mistake in entering a sign or symptom, you may click that sign or symptom to "erase" it only if it was the last one that you "clicked". For example, if you have checked tearing, photophobia and blurred vision in that order, you could "click" blurred vision again so that it would not be considered in the differential, but you could not "click" photophobia and erase it since it was not the last one that you checked. In that case you must start again.

The "Diagnose" and the "Start Again" buttons are two important buttons on this card. Click each one for more specific information.
This shows how many conditions present with the signs and symptoms checked above. It is recommended to "Diagnose" when this number is less than five to allow you to see several of the possible causes of the red eye. You may always return to enter another sign or symptom to make the list smaller.
Conditions Covered in This Program

**Trauma:**
Click a topic below.

- Chemical Burn
- Conjunctival Foreign Body
- Corneal Abrasion
- Corneal Foreign Body
- Subconjunctival Hemorrhage
- Thermal/UV Keratopathy
- Traumatic Iritis

**Cornea:**
Click a topic below.

- Acute Interstitial Keratitis
- Contact Lens Related
- Corneal Abrasion
- Infectious Corneal Ulcer
- Dry Eye
- Exposure Keratopathy
- Filamentary Keratopathy
- Herpes Simplex Keratitis
- Herpes Zoster Ophthalmicus
- Phlyctenulosis
- Pterygium
- Recurrent Corneal Erosion
- Sup. Punctate Keratopathy
- S. L. Keratoconjunctivitis
- Trachoma
General Work Up for a Red Eye

CAREFUL CASE HISTORY:
- Statement of chief complaint. Is it vague or specific? Vague is usually not as serious.
- How does it feel? Explore the following:
  -- Pain (slight/moderate/severe/dull/discomfort), discharge (type and amount) itching, burning, FB sensation, photophobia.
  -- Time frame (onset, frequency, duration, getting better or worse?)
  -- Vision affected? Diplopia?
- Trauma? (high speed object/ blunt injury/chemical injury)

- Patient's and Family's systemic health and ocular health (previous episodes)
- Patient's medications/ allergies (both medical and seasonal)

OBJECTIVE: (Wash hands before and after examining the patient. Do not inocculate yourself or the fellow eye --> use cotton swabs and two fluorescein strips if red eye unilateral)
- Visual acuity ( if < 20/20 use pinhole) Use topical anesthetic if needed. Must get VA s!!
- External exam with penlight (symmetry, edema, hyperemia, palpate for tenderness)
- Pupils, Versions, Confrontation fields, Preauricular lymph node palpation
- SLE: Lashes/Lids/Conj (papillae, follicles, membrane, evert lid if necessary, chemosis, hyperemia, hemorrhagic), Sclera/Episclera/Cornea (edema, infiltrates, KP's, Anterior Chamber (cells/flare/hyphema/hypopyon/angle), Iris, Lens
- IOP (unless corneal insult, infection, or hyphema)
- Fundus evaluation (DFE indicated in trauma)
Differential Diagnosis of a Red Eye

☐ No Pain  ☐ Severe Pain
☐ Mild to Moderate Pain

If the level of pain is to be included in the differential diagnosis, then select one of the above that best fits the patient's symptoms.

If you would prefer to not include the level of pain in the differential diagnosis, then press the button below:

☐ Do not include pain
### Differential Diagnosis of a Red Eye

#### Check any of the appropriate signs and symptoms below:

- **FB Sensation**
- **Photophobia**
- **Tearing**
- **Purulent Discharge**
- **Itching**
- **Blurred Vision**
- **Burning**
- **History of Trauma**
- **Lid Edema**
- **Headaches**
- **Halos**
- **Skin Rash**
- **Diplopia**
- **Diffuse Injection**
- **Sectorial Injection**
- **Perilimbal Injection**
- **Miotic pupil**
- **Mid-dilated pupil**
- **SPK**
- **Subepithelial infiltrates**
- **Stromal infiltrates**
- **Lymphadenopathy**
- **Lid Crusting**
- **Chemosis**
- **Anterior Chamber Rxn**
- **Corneal Edema**
- **KPs**
- **Hypopyon**
- **Pannus**
- **Symblepharon**
- **Increased IOP**
- **Decreased IOP**
- **Follicles**
- **Papillae**
- **Nodule**

<table>
<thead>
<tr>
<th>Condition(s)</th>
<th>Diagnose</th>
<th>Start again</th>
</tr>
</thead>
</table>
Diagnosing...
List of Possibilities

"Click" on a condition to see it's critical sign for a positive diagnosis.

- Infectious Corneal Ulcer
- Recurrent Corneal Erosion
- Herpes Simplex Keratitis
- S. L. Keratoconjunctivitis
- Blepharitis
- Viral Conjunctivitis
- Vernal Conjunctivitis
- Ocular Rosacea
- Dry Eye
- Epidemic Keratoconjunctivitis

Back to List of Signs and Symptoms
General Information:

Incidence/Etiology

Predicting potential cases

Classification & Naming

Risk Factors:

- Narrow angle
  - (5% of the population)
  - (45% have angle that is critically narrow)

- Hypemia
- Perivalve's
- White or black
- Age (mid 40s)
- Familial history

Typically, an older person with a small globe and a significant narrow anterior chamber angle.

Incidence and etiology

Types of Angle Closure Glaucoma:

- Acute (most common):
  - Increased IOP, closed angle, mid-dilated pupil, normal edema, pupillary block, iridocorneal effusion, pain of trigeminal distribution

- Subacute:
  - Sudden iridocyclitis

- Chronic:
  - Gradual reduction begins superotemporally

40-50 mmHg IOP without symptoms

Critical Signs:

- Gonioscopy
- Glaucomatous cupping
- Shallow anterior chamber
- Narrow angle
- Pupil border visible

Gonioscopy

Grades of Angle Narrowing:

- Grade I angulation
- Grade II angulation
- Grade III angulation
- Grade IV angulation

Anatomic

- Schwalbe's line
- Nonpigmented TM
- Pigmented TM

Differential Diagnosis

Symptoms

-眼 pain and discomfort
- Proptosis or protrusion
- Increased IOP
- Loss of vision (blurred vision)
- Color vision
- Neurovascular

- Pain
- Blurred vision
- Color vision
- Glaucomatous cupping
- Neurovascular

- All symptoms above need not be present.
Differential Diagnosis
Rule out other types of glaucoma:
- Inflammatory open angle glaucoma (moderate to severe anterior chamber reaction)
- Traumatic (hemolytic) glaucoma (trauma to RBCs in anterior chamber)
- Pigmentary glaucoma: angle is open, axial iris transillumination, pigment nests in anterior chamber and on trabecular meshwork
- Phacomorphic glaucoma: cataract, anterior chamber protein or white fleshy material present on pupillary border and anterior lens capsule
- Combined open and closed angle glaucoma

Also:
- Glaucomatocyclitic crises: mild nausea and pain, iris RPs, open angle, eye not painful, recent IOP spikes in one eye usually 40-60 mm Hg.

Gonioscopy

Work up

Emergency Treatment of Acute Angle Closure Glaucoma:
Acute angle closure is a true emergency and requires immediate care! Long-term management is surgical.

Initial Tx to lower the IOP
- Hyperosmotic (may induce vomiting) (Contraindications)
  -- Glycerol (1 g/kg of body wt) causes severe pain in diabetics
  -- Mannitol and Maxitor (IV) are also used
  -- Anderson's indentation procedure can be an alternative to the oral hyperosmotic
  -- More on indentation procedure
- Beta Blocker (Contraindications)
  -- Timolol 0.5% or Levobunolol 0.5%
- Carbonic Anhydrase Inhibitors (Contraindications)
  -- Acetazolamide (Diamox)
  -- Methazolamide (Other names)

When to use Pilocarpine

Follow-up of Acute Angle Closure Glaucoma:
- After definitive treatment, patients are reevaluated in weeks to months.
- Visual fields and stereo disc photographs are obtained for baseline purposes.
- If a repeat attack occurs after the patient has had the iridotomy, a plaque site may be present.

Differential Diagnosis

Emergency Treatment

Follow-up

Menu
Acute Interstitial Keratitis

**Common Etiologies of Interstitial Keratitis**

- Congenital Syphilis:
  - In the past, has been responsible for 90% of the cases of diffuse IK, most commonly of the congenital form. The congenital form is usually bilateral (80%).

- Acquired Syphilis:
  - IK secondary to acquired syphilis is commonly unilateral (60%), sectorial, and of a milder form.
  - A positive FTA-ABS test confirms the presence of a previous infection.

- Tuberculosis:
  - IK is often unilateral, involving the peripheral inferior sector of the cornea with central corneal spared. Resolution is slow and less complete than that due to syphilis.

- Leptospirosis:
  - IK is usually a deep infiltration extending from the periphery to the center of the cornea, especially in the upper outer quadrant. Frequently bilateral.

- Cogan's syndrome, herpes simplex, sarcoidosis, trauma, and gold toxicity are among the other systemic conditions known to cause IK.

**Other Signs of Acute Interstitial Keratitis**

- Anterior chamber cells and flare
- Fused KP's on corneal endothelium
- Indistinct cellular infiltration
- Membrane
- Small anterior synechiae
- Conjunctival injection
- The gross vascularity can give the cornea a "salmon-patch" appearance

**Definition and Incidence of Acute Interstitial Keratitis (IK)**

- The term interstitial keratitis refers to the vascularization and non-suppurative infiltration affecting all or just part of the corneal stroma. Most often, IK is associated with a systemic disease. 99% of cases are secondary to syphilis.

- The corneal opacification is generally slowly developing and often has a granular or feathery appearance.

- Manifestations of keratitis usually are not apparent until the age of 10 if the cause is congenital syphilis, with the greatest frequency occurring between the ages of 10 and 20.

- Over the years, there have been a reduction in the number of cases of congenital syphilis, and encountering a case of acute interstitial keratitis is rare. The most usual presentation of IK are congenital cases encountered during routine exams of infants. Signs of old IK often persist throughout life.

- There is a 5:1 predilection for females.

**Symptoms of Acute Interstitial Keratitis**

- Pain
- Tearing
- Photophobia
- Red eye
- Blurred vision

**Work up for Acute Interstitial Keratitis**

- History: Venereal disease in the mother during pregnancy or in patient. Difficulty in hearing or walking?
- External examination: Look for signs of congenital syphilis or leprosy.

- Slit lamp examination: Look for signs of congenital syphilis or leprosy.

- Dilated fundus examination: Look for the classic "salt and pepper" choroiditis or optic atrophy of syphilis. These are signs of an active syphilitic disease.

**Treatment for Interstitial Keratitis**

- Acute disease or old inactive disease
  - Topical cycloplegic
    - Post Foulq 4-6 hours depots of cocaine. Use appropriate pain relief.

- Refer to ophthalmic for FTA-ABS and PPD
  - Underlying cause needs to be treated.
Follow-up for Interstitial Keratitis

- Acute disease:
  - Every 3-7 days at first, then one every 3-4 wks.
  - Frequency of treatment administration is slowly reduced as the
    inflammation subsides.
  - IOP should be monitored closely and lowered with medication
    when > 30 mmHg.
- Old inactive disease:
  - Routine follow-up every year unless treatment is required for
    an underlying etiology.
**Acute Anterior Uveitis**

**Definition and Incidence**

Uveitis is a general term which can be subdivided into anterior, intermediate, and posterior uveitis. Adjacent areas such as retina, vitreous, sclera and cornea are frequently involved.

Uveitis is an inflammation of the iris, ciliary body or choroid.

Cases that are bilateral, recurant or refractory to treatment need a more extensive diagnostic evaluation to uncover an etiology. Most common ones are listed under etiologic diagnoses in the main menu.

- 50% associated with HLA-B27
- Can be limited to anterior or posterior chamber or can affect both.

**Incidence**

- Peak incidence is in the 20-50 yr population.
- There is a marked decrease in incidence in people over the age of 70.
- One study reports incidence of about 12 cases/100,000 anterior uveitis, and 3 cases/100,000 posterior uveitis.

**Etiology**

Segment affected:
- Ankylosing spondylitis
- Behcet's disease
- Herpetic uveitis
- Kawasaki disease
- Lyme disease
- Syphilis
- Tuberculosis

**Symptoms**

- Photophobia
- Phonophobia
- Reduced vision
- Vision loss

**Etiologic Diagnosis**

**Grading Cells**

- Grade 1: 1-5
- Grade 2: 5-10
- Grade 3: 10-15
- Grade 4: More than 15

**Complications Include**

- Band keratopathy
- Cataracts (especially posterior subcapsular)
- Disc/Macular edema
- Corneal edema (depends on damage to endothelium and height of IOP)
- Secondary glaucoma (ahrms in dextrophy, rubella, iris bombe, trebecular scleritis and trachiceltis)
- Retinal detachment
- Muscular surface wrinkling

**Common Etiologies of Uveitis**

- The most common cause of uveitis is unknown for all age groups.
- External causes include: trauma, ocular infection and allergic reactions.
- Internal causes include: systemic diseases and immunologic factors.

**Differentiating Signs**

- Granulomatous vs. nongranulomatous
  - 1. Large "mutton fat" KPs
  - 2. Roseate nodules (frequently)
  - 3. Burrow nodules (rarely on iris)
  - 4. Posterior synchiae (frequent)
  - 5. Generally involves posterior chamber, but can involve anterior chamber.

- 1. Fine KPs
  - 2. AC cell reaction
  - 3. Usually no nodules
  - 4. Dense synchiae (rare)
  - 5. Generally anterior chamber.

**Other Etiologies to Consider**

- Pneumonia
- Pott's herpetic iridocyclitis
- Osteomyelitis of spine
- Herpes Simplex
- Syphilis
- Synechia

**Critical Signs for Anterior Uveitis**

- Cells and flare in the anterior chamber

**Follow-Up**

- Consultation
- Segment affected
- Description

**Main Menu for Anterior Uveitis**

- Common Etiologies
- Critical Signs

**Grading Cells and Flare**

<table>
<thead>
<tr>
<th>Cells</th>
<th>1+</th>
<th>2+</th>
<th>3+</th>
<th>4+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flare</td>
<td>none</td>
<td>Just detectable</td>
<td>Mod. flare</td>
<td>Marked flare</td>
</tr>
</tbody>
</table>

**Symptoms**

- Photophobia
- Phonophobia
- Reduced vision
- Vision loss

**Complementary Tests**

- Consultation
- Segment affected
- Description
Symptoms of Anterior Uveitis

Symptoms may range from none to severe and are not related to the severity of the uveitis.

- Acute onset of deep ocular pain (dull or pulsating)
- Many times reported as "in or behind" the eye
- Increased lacrimation with near vision often impaired
- Photophobia (a constant symptom and may be the first one)
- Pain may be mild to severe
- Vision may be normal or decreased (due to cells and flare)
- May be reported as a "burning"
- Red eye
- Variable tearing but NO other form of discharge
- An associated disease entity probably present if there is a corneal or posterior discharge.

Signs of Acute Anterior Uveitis

- Generally unilateral
- Cells & flare in anterior chamber
- Uveitis (white dot)
- Pupil may be miosis
- Circumcorneal hyperemia (peribulbar flush)
- Flat KPs on corneal endothelium
- Lower IOP (occasionally may be elevated)
- Pupillary reaction
- Cells in anterior vitreous may be present
- Pseudohypopyon (photophobic)
- Hypopyon if severe case of anterior uveitis

Lid edema
- Cells not involved
- Occasional fixed pupil
- Circumcorneal hyperemia
- Moroni sign KPs
- Frequent secondary glaucoma
- Dense synechiae
- Iris nodules
- Pupil congestion
- Pupil involvement
- Cystoid macular edema

Signs of Chronic Anterior Uveitis

- Cells & flare in anterior chamber
- Uveitis (white dot)
- Pupil may be miosis
- Circumcorneal hyperemia
- Flat KPs on corneal endothelium
- Lower IOP (occasionally may be elevated)
- Pupillary reaction
- Cells in anterior vitreous may be present
- Pseudohypopyon (photophobic)
- Hypopyon if severe case of anterior uveitis

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- Moroni sign KPs
- Frequent secondary glaucoma
- Dense synechiae
- Iris nodules
- Pupil congestion
- Pupil involvement
- Cystoid macular edema

Critical Signs

- Acute onset of deep ocular pain (dull or pulsating)
- Many times reported as "in or behind" the eye
- Increased lacrimation with near vision often impaired
- Photophobia (a constant symptom and may be the first one)
- Pain may be mild to severe
- Vision may be normal or decreased (due to cells and flare)
- May be reported as a "burning"
- Red eye
- Variable tearing but NO other form of discharge
- An associated disease entity probably present if there is a corneal or posterior discharge.

Differentiating Diagnoses of Anterior Uveitis

- Granulomatous vs Nongranulomatous

Granulomatous (most likely chronic)

1. Large exudates in KP's
2. Acute nodules (soft)
3. Rubeosis nodules (cornea or iris)
4. Posterior synechiae (break)
5. Generally involving posterior chamber but can involve anterior chamber

Nongranulomatous (most likely acute onset)

1. Fine KP's
2. Acute nodules
3. Usually no nodules
4. Dense synechiae (segmented)
5. Generally anterior chamber

Surgical Considerations

- Concomitant infection
- Gonoconjunctivitis
- Herpes zoster
- Pyogenic keratitis
- Tuberculosis
- Syphilis
- Syringomyelia
- Traumatic keratitis
- Posterior synechiae
- Endophthalmitis
- Glaucoma

Work up

- Follow up

Follow-up of Anterior Uveitis

- Follow-up depends on severity. It is recommended that the patient be seen every 3-7 days in the same phase. If the condition is chronic and active, then the patient can be seen every 1-4 months.
- If the anterior chamber reaction is improving, then the steroids and cycloplegics can be tapered until chamber is free of cells. Flare may still be present.
- Steroids can be tapered 1 drop per day for 3-7 days
- Cycloplegics used every night until anterior chamber clears and tapered slowly if granulomatous reactions. (There is a higher tendency for posterior synechiae)
- Check vitreous and fundus for all flare ups, when vision is affected or every 3-6 mo.
- Educate and watch for all the complications to meridic use.
- In cases with recurrent uveitis, look for an etiology.

Differential Diagnosis of Anterior Uveitis

- Concomitant infection
- Gonoconjunctivitis
- Herpes zoster
- Pyogenic keratitis
- Tuberculosis
- Syphilis
- Syringomyelia
- Traumatic keratitis
- Posterior synechiae
- Endophthalmitis
- Glaucoma

- Other less common conditions to consider

- Treatment of Anterior Uveitis

Objective of treatment:
- To decrease the severity and frequency of the attacks
- To prevent posterior synechiae and development of secondary glaucoma
- To prevent damage to intraocular vessels and blood - aqueous barrier
- Treatment is usually nonspecific due to unknown etiology.
- Cycloplegics
  - SEVERE: Atropine 1% gd t.i.d or Scopolamine 0.5% 1 gm bd (Use with caution!) MODERATE: Homatropine 5% lid or gel or Cyclopentolate 2% bid - tid
  - MILD: Tropicamide 1.0% lid or Cyclopentolate 1% lid
- Topical steroids
  - SEVERE: Prednisolone acetate 1% every hour MILD or MODERATE: Prednisolone acetate 1% qid
- Pericorneal repository steroid should be considered if not responding well to topical eyes
- Systemic steroids are then considered if still not responding well, and possibly even immunosuppressant agents. This requires meticulous follow-up by internist and oculist.

- Work up

- Follow up

- Treatment

- Menu
**Bacterial Conjunctivitis**

**Main Menu**
- Symptoms
- Critical Signs
- Treatment
- Follow Up

**Symptoms of Bacterial Conjunctivitis**
- Redness and irritation of one eye with frequent entrocular accumulations reported
- No associated reduction in vision
- There may be a positive medical history, especially in children, e.g. upper respiratory infections (URIs), or visitor media (eye infection)
- Frequent report of "tachyemia" upon awakening
- Frequently associated with chronic blepharitis
- Glenosis

**Etiology**
- Acute bacterial conjunctivitis can be caused by a number of microbial agents. The majority of the cases present with either S. aureus, S. pneumoniae or Hemophilus as the causative agent. On rare occasions, the isolated bacteria can include Moraxella, Nesteria marnecens, or even P. aeruginosa.

**Follow Up**
- Roshadula the patient within 3-5 days
- Preventive considerations for the patient and doctor
- Treat both eyes to reduce the risk of autoinoculation
- Inspect the patient on general lid and skin hygiene
- Inspect the patient to avoid insulating the eyes during the acute distant process to avoid the possibility of reinfection
- Never reuse the medication beyond 4 weeks
- Never push an eye with conjunctivitis
- Monitor comes closely for any changes during the follow up period

**Critical Signs of Bacterial Conjunctivitis**
- Yellowish greenish mucopurulent discharge which accumulates greatest in the morning. The accumulations are generally inferiorly sided at the inner canthus. These accumulations may produce hard evanations on the lid margins.
- Often times, the patient will report "tachyemia" or "eye stuck shut" in the morning upon awakening.

**Differential Diagnosis for Bacterial Conjunctivitis**
- Differentiate staphylococcal conjunctivitis from other organisms
  - There is no need for immediate cultures in acute forms because staphylococcal is usually the cause (75% of the time)
  1. S. epidermidis and S. aureus are the usual causes
  2. H. influenzae is usually associated with a purulent or yellow discharge
  3. C. trachomatis is always hyperaemic in conjunctival with vascular signs

**Treatment of Bacterial Conjunctivitis**
- Topical antibiotic therapy is generally efficient to manage most cases of bacterial conjunctivitis. The results of culture and antibiotic sensitivity will provide adequate information for specific therapy. Depending on the bacteria present, a specific antibiotic can be chosen. Refer to an ophthalmologist for more information.

**Follow Up**
- Monitor closely for any changes during the follow up period

Erythromycin may be either bacteriostatic or bactericidal and is most effective against gram-positive cocci such as S. aureus and S. pyogenes. Erythromycin has one of the lowest incidences of allergic or toxic side effects when applied topically to the eye.
**Bacterial Corneal Ulcer**

**General Information**
- **Diagnosis**
- **DBx**
- **Work Up**
- **Treatment**
- **Follow-up**

**General Information: click a topic**
- **Etiology**
- **Corneal Ulcer vs Infiltrate**
- **General**

**Etiology of Infectious Keratitis**

<table>
<thead>
<tr>
<th>Common Pathogens</th>
<th>Gram Stain</th>
<th>Rate of Progression</th>
<th>Key Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. aureus</td>
<td>G+</td>
<td>Usually days</td>
<td>Purulentropy discharge, inflammation, redness</td>
</tr>
<tr>
<td>E. Pustules</td>
<td>G+</td>
<td>3-5 days</td>
<td>Gray well circumscribed ulcer, hazy cornea</td>
</tr>
<tr>
<td>P. aeruginosa</td>
<td>G-</td>
<td>Hours</td>
<td>Thready mucopurulent discharge, hypopyon</td>
</tr>
<tr>
<td>N. gonorrhoea</td>
<td>G-</td>
<td>12-24 hours</td>
<td>Hypopyon, purulent discharge</td>
</tr>
<tr>
<td>H. influenza</td>
<td>G-</td>
<td>7</td>
<td>Often a bluish purplish conjunctival flush</td>
</tr>
<tr>
<td>Moraxella</td>
<td>G-</td>
<td>7</td>
<td>Generally in allergic or atypical cases, Periorbital or perilimbal inflammation</td>
</tr>
</tbody>
</table>

**Corneal Ulcers vs Infiltrates**

- **Any** corneal break extending from the epithelium through Bowman and into the stroma is an **ULCER**.

- **Corneal Ulcers** may appear as small, whitish opacities in the subepithelial zone. They are usually ill-defined with intact overlying epithelium. They do not leak.

- A **corneal subepithelial infiltrate** underlying an epithelial break should be considered an ulcer until proven otherwise.

- True differentiation between infectious and non-infectious ulcers requires culturing.

**General Information about Corneal Ulcers**

- Ulcers may result from hypersensitivity reactions, trauma or infections.

- Central ulcers are often infectious while peripheral ulcers are generally toxic resulting from antigen/antibody reactions to Staph.

- Unchecked corneal ulcers, regardless of whether they begin, progress away from the limbus.

- The most common cause of corneal infection in developed countries is herpes simplex.

- Signs, symptoms and diagnosis of corneal ulcers vary greatly for both the central less severe and the nonsevere. Suspect O. organisms in contact lens wearers.

**Critical Signs for Infectious Corneal Ulcer**

- An ulcer exists if the infiltrate is accompanied by an overlying epithelial defect that bleeds with fluorescein.

**Critical Signs**

- **Sudden** visual symptoms: *Photophobia, Red eye, Edema, Edema of orbital tissues, Ciliary Injection*.

**Symptoms**

- **Significant** visual symptoms: *Photophobia, Red eye, Edema of orbital tissues, Ciliary Injection, Blurred vision, Foreign body sensation, Burning, Tearing*. May have a history of trauma. All symptoms above need not be present.

**Making the Diagnosis of Infectious Keratitis**

- Making the diagnosis can be difficult. You must distinguish microbial keratitis from other types of infiltrative and ulcerative keratitis.

- Since there is no absolute histopathologic sign of infection, you must proceed with laboratory investigations if there is any suspicion of microbial keratitis.

- After making the diagnosis and performing the proper lab tests, the next three steps are: 1) Initiate therapy, 2) Modify initial therapy, and 3) Terminate therapy.

**Signs of Infectious Keratitis/Bacterial Corneal Ulcer**

- Generally unilateral
- Epithelial defects
- Conjunctival injection (congested red = 180 degrees)
- Chemosis
- Stromal edema and inflammation surrounding the infiltrate
- Management discharge
- Anterior chamber reaction
- Hypopyon
- Epithelial keratitis
- Ciliary injection
- Papillary changes
- Increased IOI
- Lid edema
- Pupil reaction

- All signs above need not be present.
**Differential Diagnosis**

For more information about the following conditions, click on each topic below.

- Fungal Keratitis
- Acanthamoeba
- Herpes Simplex Keratitis

**Making the Diagnosis**

- Work up

**Treatment of Infectious Bacterial Keratitis**

The two goals are to eliminate causative agent (bacteria) and suppress inflammatory response.

- Consider and coordinate the most appropriate professionals for care and management. Ulcers and infiltrates are generally mixed as bacterial unless there is a high suspicion of fungal, acanthamoeba or HSV keratitis. See CED's card.

- Hospitalization should be considered if there is a severe sight-threatening infection, if the patient is unable to comply with the antibiotic therapy due to the frequency of administration, or if systemic antibiotics are needed.

- There is little to gain initiating steroid therapy prior to positive identification of the organism. Certain ophthalmic therapy is controversial.

- Consult with ophthalmology.

**Follow up of Bacterial Infectious Keratitis**

- The patient is seen daily to re-evaluate. The size and depth of infiltrate should be noted along with degree of pain, size of epithelial defect, and anterior chamber reaction. Check IOP.

- If ulcer improves, antibiotic therapy is tapered. Therapy is modified based on culture results.

- If the ulcer has not improved, ulcer should be biopsied and hospitalization should be reconsidered. Some suggest rechallenge within 48 hrs. and every 24 hours after until culture is negative.

- Continue with patient education, and RTC if pain increases or vision decreases.

**Work up for Infectious Keratitis**

- Case history: Do they wear contact lenses? If so, how does patient take care of them? Does patient swim with them on? Any trauma or Dennis foreign body? Abrasion with vegetable matter? Any previous corneal disease or systemic illness? Is the patient taking any medications?

- Visual acuity/Finshent if > 20/20

- S1E Document size, depth and location of lesion. Is there epithelial involvement over the infiltrate? Look for anterior chamber reaction (before fluorescein) and check IOP.

- If significant discharge, remove palpebral conjunctiva. If you suspect an infectious infiltrate or ulcer, a corneal scraping should be performed.

- Corneal sensitivity testing can help differentiate HSV keratitis. Use a separate wisp for each eye.

- If severe, refer to corneal specialist.

**Specific TH**

**General TH**

**Follow up**

**Which antibiotic??**

1. Cycloplegia (i.e., 5% Monotropine q2h).
2. Topical antibiotics (depends on size and severity)
   - If a small noninflammatory infiltrate with no anterior chamber reaction or no discharge:
     - Broad spectrum antibiotics (Polymyxin B/Bacitracin ung qid)
     - If contact lens wearer, use Tobramycin drops q2-4 hrs. Also consider adding Tobramycin ointment at night.
   - If large invasive infiltrates or moderate severe anterior chamber reaction or discharge:
     - Irido-cycloplegia. Generally a minimum of two antibiotics are used with one of them being either Gentamicin or Tobramycin. This means one drop every 30 minutes.
3. Subconjunctival antibiotics should be considered in severe cases.
4. Oral and IV antibiotics are instituted in ulcers with significant threat of corneal perforation.
5. Oral pain medications are often indicated.

NO CONTACT LENS WEAR AND NO PATCHING IN AN EYE WITH INFECTION.
**Etiology of Blepharitis**

- Chronic blepharitis is a disease that will be commonly seen in the office. Recently, an updated classification divides chronic blepharitis into three main categories: the first being that of superficial blepharitis, the second one being meibomian gland dysfunction, and the third classification being meibomian gland dysfunction.

1. **Superficial Blepharitis:** This is a condition caused by a chronic superficial infection of the eyelid margin, the disease generally seen in early childhood and may continue throughout life.

2. **Meibomian Gland Dysfunction:** This is a disorder of the glands of Zeiss which is frequently associated with meibomian gland dysfunction.

3. **Meibomian Gland Dysfunction:** This is a disorder of the meibomian glands and can be thought of as a posterior form of meibomian blepharitis.

**Signs of Blepharitis**

1. **Superficial Blepharitis:** Clinical features include inflamed eyelids (greater than that of superficial blepharitis) and sometimes, irritation along the outer ciliary portion of the lids. The lid margins are typically involved, including telangiectatic changes. Lying of the lashes occurs with collarettes surrounding the individual lashes. Anterior and posterior bands are intermittently noted.

2. **Meibomian Blepharitis:** Clinical features include inflamed eyelids with frequent examinations than superficial blepharitis. The debris distributed on the eyelids has an oily and greasy consistency that is often called "scurf". There is typically also dermato-oculitis findings in support the diagnosis.

3. **Meibomian Gland Dysfunction:** The most prominent feature is diffuse inflammation around the meibomian glands, which are often swollen with thickened content that is usually expressed. The surface of the glands may be charred and may be associated with inflammation. The interscleral aspect of the lid is frequently only involved with a deposition of an oily meibum.

**Symptoms of Blepharitis**

**Superficial Blepharitis:**
- Itching
- Burning
- Stinging
- Photophobia

**Meibomian Blepharitis:**
- Itching
- Burning
- Stinging
- Photophobia

**Meibomian Gland Dysfunction:**
- Stinging
- Blurred vision secondary to the oil in the precorneal film

**Treatment for Blepharitis**

The treatment for blepharitis is very similar and is routinely administered without the use of bacterial cultures. However, if a certain treatment modality is unsuccessful, a standard work up should involve a bacterial culture and/or smear to assess the infecting organism (s).

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Superficial Blepharitis</th>
<th>Meibomian Blepharitis</th>
<th>Meibomian Gland Dysfunction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Itching</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Burning</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Stinging</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Photophobia</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Critical Signs for Blepharitis**

- Crusty, red, thickened eyelid margins with prominent blood vessels (keraunia) or ulcerated oil glands at the eyelid margins (meibomian)

**Follow Up Care for Blepharitis**

- Should be stable or improving in 48 to 72 hours.
- Continue treatment for at least 5-7 days.
- If condition is worsening:
  - Recomend diagnosis
  - Check patient compliance/education
  - Re-evaluate for pre-capsular cataract development
- Consider adding a broad-spectrum oral antibiotic
- Upon resolution, instruct preventative measures

- Improvement is usually significant in 48 hours.
- Gradually reduce dosages to maintenance levels.
- If no improvement:
  - Recomend diagnosis
  - Check patient compliance/education
  - Continue treatment plan
- Discontinue administration in aqueous form
- Advise patient on potential chronicity
  - Produce fatty foods in all dietary types
  - Insulin or ongoing preventative and maintenance therapy

**Dosage/Duration**

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Acute presentation</th>
<th>Chronic presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin/whisker hygiene</td>
<td>Daily/Every 2 days</td>
<td>Daily/Every 2 days</td>
</tr>
<tr>
<td>Hot compresses</td>
<td>Every 4 hours</td>
<td>HS/3-5 times/week</td>
</tr>
<tr>
<td>Lid massage</td>
<td>Not indicated</td>
<td>HS/3-5 times/week</td>
</tr>
<tr>
<td>Lid scrubs</td>
<td>HS for 1 week</td>
<td>HS/3 or less RTC</td>
</tr>
<tr>
<td>Lid ointment</td>
<td>q8h / 5-7 days (e.g., gentamicin)</td>
<td>HS/2-4 week (Bactracin)</td>
</tr>
</tbody>
</table>
**Etiology of Canaliculitis**

- Canaliculitis is a relatively rare condition occurring in only about 5% of the population with tearing problems. The most likely causative agents are Actinomyces, fungal, viral, or chemical. Recently an allergic etiology has been reported.

- The initial diagnostic suspicion is the consideration of the patient’s age. Actinomyces infections are more prominent among patients over the age of 30, whereas herpetic infections have a higher incidence in patients under the age of 20.

**Critical Signs of Canaliculitis**

- "Wrinkle sign" - compression of the medial canthal skin appearing as a wrinkle.

- This sign generally suggests that there may be internal obstruction of the lacrimal drainage system.

- The observation of smooth skin with the ability to advance an instrument to the hard stop of the lacrimal bone generally indicates a patent nasolacrimal drainage system.

- Erythematous skin surrounding the punctum

**Work Up for Canaliculitis**

- Gently apply pressure to the lacrimal sac with a cotton tip, rolling it toward the punctum. Observe for any punctal discharge.

- If there is any material expressed, laboratory exams and cultures should be evaluated. Possible stains or slimes include: (1) C-reactive protein (CRP), (2) Gram stain, (3) Thiopectin and Sonne’s cultures, or (4) a KOH smear if available. (Apply 1 drop of 20% KOH on a slide along with a sample of the material expressed.)

**Treatment for Canaliculitis**

1. Remove the obstructive concretions and culture
2. Irrigate the canaliculus with 100,000 units of penicillin G solution or a 1% solution of sodium bicarbonate should take place while the patient is in the upright position so that the solution will drain out of the nose and not into the nasolacrimal duct.
   - If the solution reveals a fungus - use nystatin 1:20,000 drops tid in conjunction with a sodium 1:20,000 solution irrigation several times per week
   - If the solution reveals a herpes virus - use interferon alpha 1% drops (e.g. Vimpic) 5 X 1 day for several weeks
3. Warm compresses applied to the punctal area qid
4. More extensive surgical treatment may be recommended.

**Signs and Symptoms of Canaliculitis**

- Unilater al red eye that has been resistant to antibiotic therapy
- Mild tenderness over the involved area of the upper eyelid
- Swelling
- Watery discharge
- Tearing
- Punctal discharge

**Differential Diagnosis of Canaliculitis**

1. Discharge
   - Usually present with mucous, swelling, tenderness, and pain compared to canaliculitis.
2. Nasolacrimal duct obstruction
   - Usually presents with swelling and tenderness around the punctum.
3. Conjunctivitis
   - Usually accompanied with conjunctival papillae and/or follicles in conjunction with a discharge.
Emergency Treatment for Chemical Burns

- The primary step in management is prompt. Allowing the offending agent initial irritation should take place at the site of injury. If wearing contact lenses, lenses should be removed. If patient has called the office, be sure to get name and phone number, and instruct patient over the phone about irritation.
- Irrigate the eye and the ocular surface with copious amounts of water or saline for at least 30 minutes or until pH reaches normal range (7.3-7.5). It may be helpful to place an eyelid speculum and topical anesthetic in eye prior to irrigation if patient is in the office.
- It is essential to irrigate the fornices and remove any caustic material. Do not use acidic solutions to neutralize alkaline or vice versa.
- 5 minutes after irrigation, (allow for equilibration), tissue paper should be touched to the inferior cul-de-sac to check to see that pH is still in the normal range.
- Rapid transport to an emergency facility (ophthalmology) is generally necessary. Cell phone so that treatment will be waiting when the patient arrives.
- Emergency treatment may be the most important determinant in the ultimate prognosis of the burn. Generally, subsequent damage is directly proportional to how long the offending agent remained in contact with the tissue.

Main Menu for Chemical Burns

Alkalis vs Acids

Common alkalies:
- Ammonium hydroxide (Ammonia)
  - Enters the cornea rapidly
  - Used as fertilizer, refrigerant, and in chemical refinement
- Household ammonia usually 7%, but can be found as high as 35%.
- Calcium hydroxide
  - Skin, lungs, stomach, and eyes
- Sodium hydroxide
  - Alkali

Common acids
- Sulfuric acid
- Hydrochloric acid
- Nitric acid

Classification of Burns

Common acids

Critical Signs

Other signs associated with Chemical Burns

Mild to Moderate Burns:
- Focal area of conjunctival chemosis, hyperemia and/or hemorrhage, mild anterior chamber reaction, mild lid edema, burns of periorbital skin.
- Increased IOP, burns of periorbital skin, local conjunctival chemosis, due to direct penetration of alkali through the skin.

Moderate to Severe Burns:
- Pronounced conjunctival chemosis and periorbital blanching
- Vision decreases and vasoconstriction of conjunctival or epibulbar vessels

Prognosis

General Information

General Information About Chemical Burns

- Chemical burns may range in severity from minor striae and irritation to severe burns.
- When clinically significant chemical burns do occur, they constitute a true ocular emergency and prompt treatment is warranted. They can usually caused by alkaline or acids, but surfactants and detergents can also cause severe damage.
- Near gas, mace or ocular injuries caused by sparks and flares should also be treated as chemical burns.

Prognosis

Main Menu

Other Signs Associated With Chemical Burns

Mild to Moderate Burns:
- Focal area of conjunctival chemosis, hyperemia and/or hemorrhage, mild anterior chamber reaction, mild lid edema, burns of periorbital skin.
- Increased IOP, burns of periorbital skin, local conjunctival chemosis, due to direct penetration of alkali through the skin.

Moderate to Severe Burns:
- Pronounced chemosis and periorbital blanching
- Vision decreases and vasoconstriction of conjunctival or epibulbar vessels

Main Menu for Chemical Burns

Critical Signs for Chemical Burns

Mild to Moderate Burns:
- Conjunctival chemosis: SRK, focal chemosis, leukocoria, anterior chamber reaction, mild lid edema.
- Severe burns of periorbital skin.
- Increased IOP, burns of periorbital skin, local conjunctival chemosis, due to direct penetration of alkali through the skin.

Moderate to Severe Burns:
- Pronounced chemosis and periorbital blanching
- Vision decreases and vasoconstriction of conjunctival or epibulbar vessels
- May also have a tendency to severe anterior chamber reaction.

Main Menu

Menu

Critical signs

Follow-Up

Alkalis vs Acids

Alkalis vs Acids

Classification of Burns

Emergency Treatment for Chemical Burns

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- Rapid transport to an emergency facility (ophthalmology) is generally necessary. Cell phone so that treatment will be waiting when the patient arrives.
- Emergency treatment may be the most important determinant in the ultimate prognosis of the burn. Generally, subsequent damage is directly proportional to how long the offending agent remained in contact with the tissue.
Work up of Chemical Burns

- Irrigate eye till pH is neutral.
- History:
  - Time of injury? What chemical was the patient exposed to? Duration of exposure before irritation and duration of irritation? How much of the chemical got into the eye?
- Visual acuity
- Slit lamp exam with fluorescein (Assess damage)
  - Even eyelids to search for foreign bodies.
  - Epithelium (intact vs compromised)
  - Corneal edema (abnormal vs specified)
  - Perilimbal vessels (engorged vs blanched)
- Check IOP if possible

Complications of Chemical Burns

Below is a list of conditions commonly associated with chemical burns:
- Chronic anterior uveitis
- Chronic glaucoma
- Exudation
- Infection
- Keratitis sicca
- Neovascularization and pneumatosis
- Perforation
- Phthisis bulbi
- Scarring
- Symbiosis
- Ulceration

Treatment (after Irrigation) for Chemical Burns

- Treatment is aimed at promoting epithelial healing, avoiding infection, and preventing neural ulceration. Consult with Ophthalmologist.

1. Antibiotics are essential to prevent secondary bacterial infection. (i.e. Tobramycin drops 0.3% qid / Tobramycin ointment 0.3% qid)
2. Cycloplegics to reduce pain, inflammation, and prevent synechiae (i.e. cyclopentolate 1.0% or neosynephrine 2.5% and phenylephrine 2.5%)
3. Hypertonic saline in presence of increased IOP
   (i.e. Bepotan 0.5% bid)
4. Corticosteroids use is controversial. Some suggest use for first week in moderate to severe burns. (i.e. Decadron 0.1% qid)
5. Two new treatments under investigation:
   - Acetic acid and citric acid 10%
     (decrease incidence of permanent ulceration and perforation)
6. Surgical intervention may be necessary in some severe cases.

Complications

- Rhabdomyolysis every 24 hours in moderate to severe cases.
- If using steroids, always taper after 5-7 days, especially in alkali burns, to minimize ulceration risks.
- Taper antibiotic but continue until there is no longer any staining.
- Prognosis is good for mild chemical burns with complete resolution in 1 to 2 weeks. Moderate burns may take up to 6 weeks to heal, especially if an alkali burn.
- Prognosis is poor in severe burns with significant risk of secondary ulceration, infection, scarring and perforation.
- Long-term therapy depends on the severity of the burn.

Follow-up for Chemical Burns

- Recheck every 24 hours in moderate to severe cases.
- If using steroids, always taper after 5-7 days, especially in alkali burns, to minimize ulceration risks.
- Taper antibiotic but continue until there is no longer any staining.
- Prognosis is good for mild chemical burns with complete resolution in 1 to 2 weeks. Moderate burns may take up to 6 weeks to heal, especially if an alkali burn.
- Prognosis is poor in severe burns with significant risk of secondary ulceration, infection, scarring and perforation.
- Long-term therapy depends on the severity of the burn.

Complications Menu for Chemical Burns
**Critical Signs of Chlamydial Conjunctivitis**

- An acute follicular conjunctivitis with a mucopurulent discharge occurring after an incubation time of approximately 4-12 days.
- This disease usually occurs in sexually active young adults but is by no means limited to any specific population.
- The ultimate diagnosis is facilitated by the presence of intraepithelial (inclusion) bodies apparent in epithelial cells obtained by conjunctival scrapings.

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**Main Menu For Chlamydial Conjunctivitis**

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**Symptoms of Chlamydial Conjunctivitis**

- Acute bilateral onset
- Watery and mucoid discharge
- Sticking of the lid in the morning
- Foreign body sensation
- Conjunctival hyperemia
- Swelling of the lid

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**Work Up of Chlamydial Conjunctivitis**

**Laboratory Tests Used to Identify Chlamydial Infections:**

1. Culture of swabs
2. Specimen for direct immunofluorescence
3. Nucleic acid amplification test (NAAT)
4. ELISA test
5. Serum antibody levels measured by complement fixation (CF) or microimmunofluorescence (MIF) test.

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**Treatment of Chlamydial Conjunctivitis**

**Systemic:** It is necessary to use systemic antimicrobial treatment because the infections produced in chlamydia are not limited to the eye.

- For infants, effective therapy is provided by oral erythromycin, 60 mg/kg daily in four divided doses for 2 weeks.
- Adults: Daily administration of tetracycline 250 mg po qd for a duration of 6 weeks.
- Erythromycin is effective at doses of 250 mg po qd for 6 weeks. Doxycycline, which is better absorbed than tetracycline, is another alternative at a dosage of 300 mg weekly for 3 weeks or 100 mg daily for 2 weeks. All systemic medications should be administered to the patient as well as their sexual partners.

**Ocular:** Topical tetracycline, erythromycin, or sulfacetamide ointment have all been used 2-5 X/day for 6-8 weeks.

**Avoid** tetracycline in pregnant females, mothers who are nursing, and children less than 8 years of age.
Follow up for Chlamydia Conjunctivitis

- Patients with milder manifestations should be examined every 1-3 weeks depending on the severity of the condition. The patient, as well as their sexual partners, should also be evaluated by their physician for other sexually transmitted diseases.

- Clinical signs of chlamydial conjunctivitis may take 3-3 weeks to resolve completely with treatment. Conjunctival findings such as SPK and subepithelial infiltrates may persist for 6-12 months.

- If the patient is a contact lens wearer, it is very important that the lenses be discontinued until 2-4 weeks following the resolution of the disease.
Critical Signs

- Presence of conjunctival or subconjunctival foreign body
- Generally there is history of trauma.
- Some of the more common types of foreign bodies include:
  - metal, bits of rust, cinders, sand, vegetable matter, glass, and fiberglas.

Signs

- Palpebral conjunctival foreign bodies on mucosa. If the PB is under the upper lid, linear conjunctival abrasions may be present.
- Bulbar conjunctival foreign bodies imbed in the superficial conjunctival tissue.
- Conjunctival lacerations may be present.
- Subconjunctival hemorrhage may be present.
- Chronicity.
- Foreign body granulomas may develop if long standing FB.
- IOP could be low if aural puncture.

Work-up

- Case History:
  - If history of trauma, get the details of the accident. This includes the events, and objects producing the injury. History of grinding or metal fusing metal?
  - Was eye protection worn? What was the scalar status before the injury?
  - Presence of systemic disease, allergies, meds. Ill of trauma immunization.

- Visual exam: with best correction and pinhole.

- Slit-lamp Exam:
  - Determine number and depth of foreign body(s).
  - Direct lid and inspect fornices for additional foreign bodies. (Double lid exam)
  - Carefully evaluate the area to rule out subconjunctival and intracorneal FBs.

- DPC:
  - Carefully evaluate the area under the conj. bodies. Look for possible intracorneal FB and retinal damage especially if injury is due to metal striking metal.
  - Consider II-scan ultrasound and CT scan of orbit to rule out intracranial/intraorbital FB under internal globe.

Symptoms

- Irritation
- FB sensation to pain.
- There may be FB sensation with each blink depending on where the FB is located.
- Tearing
- History of trauma
- Photophobia

Preliminary evaluation

- Palpebral conjunctival foreign bodies on mucosa. If the PB is under the upper lid, linear conjunctival abrasions may be present.
- Bulbar conjunctival foreign bodies imbed in the superficial conjunctival tissue.
- Conjunctival lacerations may be present.
- Subconjunctival hemorrhage may be present.
- Chronicity.
- Foreign body granulomas may develop if long standing FB.
- IOP could be low if aural puncture.

Treatment of Conjunctival/Subconjunctival Foreign Bodies

- Remove foreign body (under magnification):
  - Apply 2 drops of topical anesthetic.
  - Lavage vigorously.
  - If FB is loose and on the surface, it can be removed with a cotton-tipped applicator or FB speck.
  - If multiple FBs, irrigation may remove them easier. Remove as many as possible.
  - If they are very small and relatively inaccessible, they can sometimes be left in the eye without harm. Consult with a specialist.
  - Deep FBs should be referred to a specialist.
- Sweep the fornices with a sterile cotton-tipped applicator soaked with topical anesthetic.
- Topical broad-spectrum antibiotic (Erythromycin, Gentamicin)
- Artificial tears for symptomatic relief.

FOLLOW-UP: Recheck in 3-5 days and PRN.
Contact Dermatitis

Etiology

Common Drugs or Substances Known to Cause Allergic Dermatitis
- Cosmetics (including nail polish)
- Local anesthetics
- Phenol
- Polyvinyl
- Quaternary ammonium chloride
- Thimerosal
- Parabens
- Potassium sorbate
- Aloe vera
- Tolbutamide
- Phenylephrine
- Lanolin
- Rubber or nickel (eyelash curler)

**NOTE**
Erythromycin has never been reported to cause an allergic contact dermatitis

Signs and Symptoms of Contact Dermatitis
- Sudden onset of periorbital rash or eyelid swelling
- itching
- Redness
- Swelling
- Parsenes
- Dryness
- Numbness
- Burning
- Stinging

Primary reaction may be accompanied by secondary irritation

Treatment of Contact Dermatitis
- Eliminate the offending agent.
- Cool compresses 4 - 6 times a day for severe cases.
- Oral antihistamines (e.g., Benadryl) 25 - 50 mg po 3 - 4 times a day. Topical antihistamines will have little effect if the sternal involvement is minimal.
- Mild steroid or cream ointment (e.g., 1% hydrocortisone) is helpful in dry, scaly, and chronic stages, and should be applied to the periorbital area 2 - 3 times a day until the reaction subsides.

Follow Up for Contact Dermatitis
- Reexamine within one week and taper the steroid cream upon the remission of the symptoms.

Main Menu

Common Agents

Etiology

Contact dermatitis is either classified as primary irritant (nonallergic) or allergic.
- Primary irritant is most common but is soon less often in the eye, because the onset is relatively rapid (1 - 24 hours) following exposure. It is this rapid onset that allows a self-diagnosis and avoidance of the offending irritant.
- Allergic contact dermatitis, on the other hand, is a delayed cell-mediated hypersensitivity reaction that usually involves the eyelid and may secondarily involve the conjunctiva. The onset of allergic dermatitis can occur anywhere from 12 - 72 hours after the exposure is as long as one year, depending on the potency of the irritant.

Critical Signs

Common Signs of Contact Dermatitis
- Periorbital edema
- Erythema
- Vesicles
- Thickening or hardening of the skin

Follow Up

Reexamine within one week and taper the steroid cream upon the remission of the symptoms.
Contact Lens Related Conditions

Signs & Symptoms of Contact Lens Related Conditions

- Varying degrees of pain
- Photophobia
- Red eye
- Foreign body sensation
- May have blurred vision
- Itching
- Corneal ulcer
- Hyperemia
- Discharge
- AC reaction (mild/moderate/severe)
- Mucous/chemosis
- Other

Etiologies

Assume that the contact lenses are the cause of the red eye until proven otherwise.

- Corneal ulcer or infiltrate
  - Viral corneal lesions that may also involve fluorescein.
  - Corneal ulcers are the most serious complications associated with contact lenses, and must be ruled out. Think Pseudomonas and Acanthamoeba especially in EV.

Sterile infiltrates in patients wearing contact lenses have a variety of causes.

Causes of Infiltrates

- BKC
  - Large superior temporal conjunctival papillae along with mucous, itching and lens intolerance
- Hyper-sensitivity reactions
  - Staph
  - Preservatives in solution (thimerosal/chlorhexidine etc.) Injection and irritation often developing after lens cleaning or insertion. (Stiffen SPC along with buffer conjunctival follicles and corneal infiltrate may be present)

Solution hypersensitivity:

- Chemical reactions to preservatives in contact lens solutions can be associated with sterile infiltrates.
  - The most common cause are thimerosal and chlorhexidine.
- May be pseudomonas or staphylococcal.

Contact Lens Etiologies to Consider

- Corneal ulcer or infiltrate
  - Pseudomonas or staphylococcal.

Other conditions

Causes of Infiltrate Keratitis

- Staph hypersensitivity
- Solution hypersensitivity
- Contact lens hypersensitivity
- Tight Lens Syndrome
- Other conditions

Work-up

- Complete case history:
  - Type of contact lens: RGP, soft (EV or DV), PMMA, disposable?
  - Method and frequency of disinfection. Wearing schedule? Homemade saline?
  - Severity and nature of ocular symptoms. Onset of symptoms.
  - When were lenses last worn?
  - ELE (RULE OUT AN INFECTION)

- Evaluate fit and condition of lenses. Deposit?
- If ulcer or infiltrate is present, capture size and staining. Note amount of edema. Check anterior chamber for reaction.
- Fluorescein strip to check for epithelial defect.
- Evert upper lid to check for follicles/papillae.
- Check BOP.
- Corned ulcer if suspect an infectious ulcer. When acanthamoeba keratitis is suspected use (vitamin A analogs) or (vitamin E analogs). In one study of untreated corned keratitis associated with contact lens wear, Pseudomonas was the most frequent organism cultured and accounted for half of the culture-positive cases.

- When suspect an infectious ulcer?

Treatment

- Treatment depends on the etiology. General therapy is presented below, but for specifics refer to the appropriate section. In all cases, it is probably necessary to at least temporarily discontinue contact lens wear.
- The importance of early treatment in corneal infections cannot be over emphasized. This is to ensure overall survival if infections in infected ulcers pending results of cultures.
- It is beyond the scope of this program to list all treatment plans for various corned lens related problems. However, therapy for the three conditions below can be seen by "clicking" on one with the mouse.

- Corned ulcer/infiltrate hypersensitivity
- Tight lens syndrome
- Other conditions

Menu
**Treatment for Solution Hypersensitivity**

- Check the solution that the patient is using for thimerosal, chlorhexidine, or potassium sorbate.
- Discontinue lens wear.
- Artificial tears (preservative free) 4-6 x daily until SPE resolved.
- Contact lens wear can be resumed once cornea is clear. Consider dispensing a new pair.
- Change to preservative free system.
- Explain proper lens hygiene including importance of thorough rinsing after use of enzymes. Avoid solutions with preservatives.

**Treatment for Light Lens Syndrome**

- Discontinue contact lens wear.
- If an anterior chamber reaction is present, treat with cycloplegia.
- Patient will probably notice photophobia, irritation and tearing for the next few days. Inflammation will probably last for several weeks.
- RTX in 3-5 days for refitting of contact lens. Fit with a flatter base curve.
## Critical Signs

- Pain (generally severe)
- Reduced visual acuity
- Photophobia
- Reduced ocular motility
- Disturbance of accommodation

## Signs

1. **Motion of the eye and blink:**
   - Normally, there is a natural cycle of blinking.
   - Increased blinking and rubbing of the eye can occur.
2. **Redness of the eye:**
   - Commonly seen in conjunctivitis.
   - Increased redness may indicate infection or irritation.
3. **Discharge from the eye:**
   - Clear or yellow discharge can be indicative of infection.

## Symptoms

### Common Presentation Pattern

- With contact lens wear
- Stick on cornea

### Critical Presentation Patterns

- Punctate corneal epithelial defect that precedes neovascularization. This may range from total epithelial dehiscence to a micropunctate epithelial defect.
- Traumatic corneal abrasion.

### Treatment of Traumatic Corneal Abrasion

1. **Antibiotics:**
   - Topical antibiotics (e.g., polymyxin, bacitracin)
   - Cyclopentolate 1-2% or homatropine 1.0% (depending on the severity)
   - Pressure patch for 2-24 hours

2. **Management of Abrasion:**
   - Generally, pressure patching is applied if the abrasion is a significant risk factor for infection (e.g., from a branch or fingerpad).
   - Ensure all foreign material has been removed from the eye.

### Work-up

1. **Details of the Incident:**
   - History and when
   - Description of the incident
   - Visual status before the incident
   - Do the patient wear contact lenses?
   - Ambulatory visual acuity (with pinhole)<20/20

2. **Eular Exam:**
   - Check for eyelid margin abrasions, conjunctivitis, lacrimal and nasolacrimal duct obstruction.
   - Concomitant infection on fluorescein stain

3. **Follow-up:**
   - Regular follow-up visits are recommended to monitor the healing process.
   - Continue monitoring for signs of infection or complications.

### Prevention

- Wear appropriate protective eyewear in areas with potential hazards.
- Remove foreign bodies immediately to prevent further damage.
**Symptoms of Corneal Foreign Bodies**

- Generally there is a history of a foreign body in the eye.
- Foreign body sensation with each blink. Patient's discomfort varies from mild to very severe.
- Tearing.
- May have blurred vision.
- Phoebias.

**Work-up for Corneal Foreign Bodies**

- Case history:
  - Did this occur during the course of employment?
  - Did the foreign body arise from metal striking metal? Was the object propelled?
  - If so, look for intrasaccular foreign body. What type of material?
- Visual acuity with pinch test < 20/20.
- Slit lamp exam:
  - Determine epithelial defect (slit lamp optic section).
  - Extern lid and inspect fornix for additional foreign bodies.
  - Check for mild anterior chamber involvement.
  - Measure dimensions of defect if present.
  - Many times metal foreign bodies will form a rust ring (orange stain).
- If injury is due to metal striking metal, clean and look at mirror and visualize to rule out intrasaccular foreign body. Also consider x-ray.

**Treatment of Corneal Foreign Bodies**

- Remove foreign body (using the slit lamp):
  - Apply 2 drops of a topical anesthetic (proparacaine).
  - Remove PB with a PB cup. 21 gauge needle or mechanical corneal tipped applicator within the slit lamp beam. (Proparacaine/Indocyanine Green, try an anterior approach)
- If multiple PBs, irrigation may remove many.
- Deep PBs (sternal) should be referred to a specialist.
- Remove rust ring (using slit lamp).
  - Usually an artifact and will remove the rust ring.
  - If rust ring is centered in the visual axis and appears deep, it may be safer to leave it in place and allow the rust to migrate to the surface that attempts to remove it. Consult with ophthalmology. Do not attempt to remove rust ring if deeper than basement membrane.
- Measure and note size of resultant corneal defect.
- Cycloplegic (cyclopentolate 1.0-2.0%)
- Antibiotic ointment (erythromycin, Gentamicin).
- If you suspect an intrasaccular PB, do not apply ointment. The injury may allow the ointment into the anterior chamber.
- Consider pressure patch for 24 hrs.

**Follow-up for Corneal Injuries**

- If the reaching corneal defect is small (< 1.2 mm), clean, and non-central, it is not necessary to remove.
- Remove pressure patch after 24 hrs and treat with topical antibiotics for 3-4 days.
- Example: Sterile saline drops qid or Neomycin/or 5% lid or orbid.
- If the reaching corneal defect is central or large with a secondary infection, incise and debride. Follow up in 24 hours to re-evaluate any of the following are present:
  - A central or large corneal defect
  - Macrophage discharge or fluid
  - Residual rust in the cornea
  - Anterior chamber reaction

**If there is an infection with a significant anterior chamber reaction, purulent discharge, or extreme redness and pain, then an infection needs to be ruled out and the condition treated more aggressively with antibiotics. Consult with ophthalmology.**
Treatment of Dry Eye

- Local treatment of the dry eye syndrome may also include increasing the aqueous phase or reducing the outflow of the aqueous phase.

1. Increasing the aqueous phase: Instillation of sodium chloride 0.45%. This treatment "cleanses" the eyes and has few side effects. The only drawback to this method is that it is very short-lived and must be applied frequently.

2. Reducing the outflow of tears: Occlusion of both puncta is required to obtain a good effect. Permanently occluding both puncta is only indicated in the most severe cases. Mucopolysaccharides or artificial tears with methylcellulose (0.5%) or polyvinyl alcohol (1.4%) reduce the lacrimal fluid in their number, thus reducing the tear flow. The instillation of these agents should be PEN. The only side effect is a plastic-like film that may deposit on the palpebral and corneal margins. An alternative to the frequent instillation of a mucopolysaccharide is a drug-release system. A hydroxypropyl cellulose intraocular lens (i.e., Lentic) can be instilled on the inferior tarsal conjunctiva and has a duration of 8 to 16 hours.

Follow up for Dry Eye

- If there is no improvement after 2 weeks:

  1. Question the patient on compliance and continue to treat for 2-3 weeks if noncompliant.

  2. If the patient is compliant, upgrade the treatment.

- If there is improvement: Both objective and subjective, taper the therapy to a minimal dosage and check every 3-6 months or PEN based on the severity.

NOTE: Patients with severe "dry eye" should be discouraged from contact lens wear.
**Entropian**

**Etiology**
- **Involutional (Aging):** This usually involves the lower lid and is caused by degradative changes. With aging, atrophy of the orbicularis can lead to a relative ptosis and a tendency for inward rotation of already shortened eyelid structures.
- **Chemical:** Due to conjunctival scarring in acute pannusoid Scurvy, Stevens-Johnson syndrome, chemical burns, trauma, trachoma, and others.
- **Spastic:** Due to surgical trauma, ocular irritation, or blepharoconium.
- **Congenital:** A rare phenomenon that is usually associated with other abnormalities such as lateral hypoplasia or microphthalmia. It may be confused with ophthalmia (eyelid infolding) which is more common and typically resolves spontaneously.

**Symptoms of Entropian**
- Occular irritation
- Corneal foreign body sensation
- Hyperesthesia or lid systems
- Red eye

**Critical Signs of Entropian**
- Inward turning of the eyelid margin.

**Treatment of Entropian**
1. A surgical procedure is usually indicated.
   - If surgery is contraindicated or refused:
     1. Complete ptosis
     2. Low wet hydrophilic bandage lenses may help
     3. An ongoing lubrication for corneal protection and comfort is indicated
     4. Erythromycin or bacitracin ointment for the cornea helps
2. Bracing the eyelid margin away from the globe and taping it in place with adhesive tape may provide temporary relief

**Follow Up for Entropian**
- If the cornea is relatively healthy, the condition does not require urgent attention.
- If the cornea is significantly thinned, aggressive treatment is indicated and follow up should be scheduled more closely until the corneal involvement resolves.
Etiology of Epidemic Keratoconjunctivitis
- Epidemic keratoconjunctivitis is known to be caused by adenoviruses 8, 19, 21 with the current type 37 predominantly recovered from persons in the United States and Europe with EKC.
- Outbreaks of EKC has been known to occur frequently in serpentine facilities and summer dispersal.
- The source of the epidemic often goes unrecognized, however, and is frequently attributed to application temperature, supplies, instruments of eye drops, and in some cases, the patient.
- Instruct individuals to seek the virus for 1 week and should be considered infectious during this period and encouraged to have limited contact with other individuals.
- The construction of EKC can be minimized through routine washing of hands between patients and the mechanical wiping and drying of instruments.

Signs of Epidemic Keratoconjunctivitis
- Generally, unilateral at onset
- Marked lid swelling
- Acute follicular conjunctivitis in the lower fornix
- Conjunctival chemosis and subconjunctival hemorrhages
- Chemosis
- Edema of the caruncle and nasolacrimal fold
- Preauricular lymphadenopathy
- Unilateral formation in the nasolacrimal duct
- Corneal diffuse SPK
- Discrete elevated epithelial lesions
- Subepithelial infiltrate
- Possible iritis
- Transient vision loss in severe cases

Differential Diagnosis of Epidemic Keratoconjunctivitis
1. Viral conjunctivitis - a pinkish purple hyperemia that increases toward the plica. There is typically a fast TRU; a follicular reaction; tearing and discharge of preauricular node or lymphadenopathy.
2. Allergic conjunctivitis - small "cherry" or "granular" papillary changes on both the upper and lower palpebral conjunctiva with the absence of preauricular lymphadenopathy.
3. Chlamydial conjunctivitis - an acute follicular conjunctivitis with a nonpurulent discharge typically seen in sexually active adults. The definitive diagnosis is made with presence of subepithelial inclusion bodies apparent in epithelial cells obtained by conjunctival scrapings.
4. Herpes simplex keratitis - usually unilateral; the keratitis is often dendritic but may appear similar; the keratitis lesions are generally absent.
5. Syphilitic keratitis - a bilateral conjunctivitis with hemorrhagic exudates of the lips and target lesions on the skin which appear as red, central vesicles surrounded by a pale ring which is surrounded by a red ring

Treatment of Epidemic Keratoconjunctivitis
- In most cases, EKC is self-limiting, with an excellent prognosis for complete recovery. Although the follicular conjunctivitis generally last a course of 7 - 14 days with the current involvement subsiding within 3 weeks, the symptoms may persist for up to 2 years. The conjunctival membrane formation can lead to scarring, resulting in a secondary cicatrical conjunctivitis.
- During the acute phase of EKC, the treatment is generally symptomatic with the use of hot compresses, topical antiseptics, decongestants or lubricants providing relief of the symptoms. Prophyllactic use of topical antibiotics is recommended due to the increased incidence of secondary bacterial infections.
- There has been much controversy in the use of topical steroids in the management of EKC. In patients with marked reduction in visual acuity, topical steroids will reduce the opacities and improve vision. However, the subepithelial opacities represent a local immune response to viral infection and, therefore, may suppress the healing process, ultimately prolonging the disease.
- Vidarabine has shown mild benefit, along with Virceptic, as being effective against certain adenoviruses known to cause EKC.

Follow Up for Epidemic Keratoconjunctivitis
- Due to the self-limiting nature of EKC, the patient should be educated on the duration of the condition with the possibility of aggravation during its course.
- If the treatment regimen consists of topical steroid use, the patient should be monitored more closely with routine intracocular pressure checks due to the nature of the drug. Steroids should be treated conservatively with proper tapering upon improvement.
- Due to the contagious nature of EKC, the patient should avoid coming in contact with other people as much as possible.
General Information:

Classification and Naming

Episcleritis is generally a benign inflammation that occurs most often in young adults with a tendency for regression and then recurrence. It can be bilateral or unilateral.

Incidence:
- It is relatively common and seems to occur episodically.
- Peak incidence is in the fourth decade and is twice as common in females as in males.

Symptoms

- Acute onset of redness (may be as little as 1/2 hr).
- Generally, redness is incipient, but can encompass entire anterior portion of the globe.
- Occasionally, only discomfort is reported (mild pain), but can be absent to severe. Patient may report heat and pricking.
- Pain is usually localized to the eye, but can radiate to the forehead.
- Eyes are nearly tender to the touch.
- Tearing is common, but no actual discharge.
- Photophobia (mild to moderate).
- Visual acuity is not affected significantly.
- Recurrent episodes of condition are common.
- Above symptoms are present in nodular episcleritis but more intense.

Etiology

- Idiopathic (most common cause).
- Herpes zoster episcleritis.
- Recurrent stromatitis.
- Cory.
- Syphilis.
- Collagen vascular diseases.
- Polycystic kidney.
- Sarcoidosis.
- Wegener's granulomatosis.
- Trauma.
- Giant cell arteritis.
- Sarcoidosis.
- Tuberculosis.
- Thyrotoxicosis.

Differential Diagnosis Episcleritis

- Common forms of conjunctivitis:
  - Viral (herpes; feline; periocular lymphadenopathy)
  - Allergic (allergic: (IgE, itching, white anterior round discharge)
  - Bacterial (acute red injection, purulent discharge)
- Polyarteritis nodosa.
- Scleritis (severe pain, diffuse injection).
- Acute reactions (chronic recurring general irritation, skin lesions).
**Work-up for Episcleritis**

- **Case History:**
  - Investigate medical history
  - rash, arthritis, venereal disease, recent medical history, medical problems

- **Visual acuity**

- **External Exam:**
  - Look for blanching of sclera in natural light (to rule out scleritis)

- **Slit-lamp Exam:**
  - Determine depth of injected vessels
  - anesthesize with proparacaine and use a cotton-tipped applicator to move conjunctival vessels.
  - Check for anterior chamber involvement (absent in simple form) and IOP.
  - Check for presence of nodules?

- 1 ggt of 2.5% phenylephrine in affected eye should bech conjunctival vessels.

- Refer for diagnostic tests if case history suggests an underlying etiology or if possible.

**Rule out**

**Treatment**

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**Follow-up for Episcleritis**

- Normal course is usually 10 - 21 days with or without treatment.

- Check weekly if patient is on topical steroids until symptoms have resolved. Also need to check IOP. Once symptoms are resolved, taper steroids.

- If patient is on artificial tears or vasoconstrictors/analgesics, patient need not be seen for several weeks unless the condition worsens or is still bothersome.

- Be sure to inform patient that episcleritis may recur in the same or fellow eye from a 3 month to 3 year period.

- If more than 3 recurrences, recommend systemic medical workup.

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**Treatment for Simple Episcleritis**

- Most cases resolve within 3 weeks without complications, and treatment is often not required. An associated uveitis (7%), may be present. Intraocular inflammation should be excluded.

- **MILD (to relieve symptoms):**
  - Artificial tears (Refresh) qid , cold packs , topical vasoconstrictor

- **MODERATE TO SEVERE:**
  - Same as above plus steroid if indicated
  - Topical steroid (prednisolone 1% bid or qid) often will relieve the discomfort. It is rare that more frequent topical steroid treatment is needed.

- **VERY SEVERE CASES:**
  - Oral nonsteroidal anti-inflammatory drugs if topical steroids do not provide relief
    - Ibuprofen 200-600 mg po 3-4x/day or
    - Aspirin 325-1000 mg po 3-4 X/day with food and/or aspirin

**Possible Complications**

**In for Nodular Episcleritis**

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**Work-up**

**Follow-up**

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**Menu**
Etiology and Presentation of Exposure Keratopathy

Exposure keratopathy presents clinically with corneal desiccation most notable in the inferior interpalpebral area of the cornea and conjunctiva. It can lead to a frank epithelial defect and a non-keratinized ulceration.

Common causes are listed below:
- Severe nerve palsy (facial nerve weakness, e.g., Bell's palsy.)
- Eyelid deformity:
  a. Ectropion or eyelid retraction from trauma
  b. Chemical burn
  c. Herpes Zoster Ophthalmicus
- Exophthalmos
- Neurotrophic keratopathy (failure to close eyes during sleep)
- Propidic (e.g., due to an orbital process, such as Graves' disease)
- Postoperative repair or prosthesis/implantation procedure

Symptoms of Exposure Keratopathy
- Ocular irritation
- Burning
- Foreign body sensation
- Redness of the eyes

** The symptoms are much worse in the morning due to the length of time that the cornea has been exposed.

Main Menu Symptoms
- Conjunctival injection
- Corneal inflammation or ulcer
- Eyelid deformity
- Abnormal eyelid closure with a results block, however, many patients are able to force a complete closure of the lid.
- Superficial punctate keratitis in a band region where the cornea has been chronically exposed
- Possible corneal neovascularization
- Epithelial erosion that is greater in the morning.

Differential Diagnosis of Exposure Keratopathy
- Herpes simplex keratitis: Usually unilateral; the keratitis is often dendritic but may appear similar; the face lesions of rosacea are generally absent.
- Dry eye syndrome: SPK results from a poor tear lake or a decreased TRM
- Allergic keratitis: presents as erythema, telangiectasia, and crusting of the eyelid margins.
- Exposure keratopathy: SPK results from poor eyelid closure with a failure of the lid to cover the entire globe.
- Pterygium: SPK results from extensive chronic irritation, causing a hyperesthesia on the margin.
- Ulcerative herpetic keratitis: SPK often seen in patients with recurrent herpes keratitis.
- Bacterial herpetic keratitis: Den in inclusion, from chronic irritation.
- Contact lens-related problems: SPK from chemical irritation, tight lens syndrome, contact lens intolerance, OCP use.
- Pterygium, superficial punctate keratitis: Bilateral with recurrent SPK in the absence of conjunctival irritation.
- Pterygium, stromal keratitis: the SPK are typically linear or spiky arranged vertically on the cornea.
- Pseudohypertrophy: SPK are typically linear from an eyelid rubbing on the eye.

Main Menu Signs
- Conjunctival injection
- Corneal inflammation or ulcer
- Eyelid deformity
- Abnormal eyelid closure with a results block, however, many patients are able to force a complete closure of the lid.
- Superficial punctate keratitis in a band region where the cornea has been chronically exposed
- Possible corneal neovascularization
- Epithelial erosion that is greater in the morning.

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Diagnosis Work Up
1. Evaluate eyelid closure and the extent of corneal exposure.
2. Slit lamp examination with fluorescein dye to evaluate the tear film and corneal integrity. Look for signs of secondary infection (corneal infiltrates, anterior chamber reaction, or severe conjunctival injection).
3. Rule out: tear dysfunction or an epithelial basement membrane disorder

Critical Signs Work Up
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Diagnosis Treatment
1. Correct the underlying disorder
2. Artificial tears (Refaxin tear gels, 6 times)
3. Lubricating ointment (Refaxin PM gels, 1%)
4. If severe, tape the eyelids closed at night in conjunction with antibiotic treatment
5. Application of an REW or disposable soft CL with frequent instillation of lubrication
6. Humidification of the air
7. Swimmers or protective goggles to maintain a moist chamber for the eyes
8. If medical therapy fails, surgical intervention may be needed:
   a. Epithelial resection
   b. Tenonectomy
   c. Surgical debridement for proptosis
   d. Conjunctival flap

Diagnosis Follow Up
- Conjunctival injection
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Follow Up for Fungal Keratitis

- If corneal ulceration is present - re-evaluate every 1-3 days.
- For less severe corneal pathology - re-evaluate every 7-20 days.
- Manage the secondary corneal involvement every 3 months.
**Symptoms**

- Dry eye syndrome; in particular keratoconjunctivitis sicca (KCS)
- Erosions may be associated with autoimmune diseases such as Sjogren's
- The filaments may be distributed diffusely and are often associated with areas that stain with fluorescein. Refer to diagnostic tests in "KCS stock".
- Superior limbic keratoconjunctivitis (SLK)
- Filaments are often distributed over the superior portion of the cornea
- See diagnostic tests in "SLK stock".

**Critical signs for filamentary keratopathy**

- Short threads or strands of epithelial cells and mucous which are attached to the anterior surface of the cornea at one end of the strand.
- Strands usually develop in the lower third of the cornea.
- Strands stain strongly with rose bengal and less strongly with fluorescein.

**Other signs of filamentary keratopathy**

- Conjunctival injection
- Poor tear film
- SPK (superficial punctate keratopathy)
- Small, greyish, subepithelial, granular opacities form beneath the filaments

**Work-up for filamentary keratopathy**

- There are many conditions which can produce filamentary keratopathy. Any condition leading to focal epithelial erosions may produce a filamentary keratopathy.
- Try to ascertain the etiology.

**Treatment of filamentary keratopathy**

- Initially the eye should be stabilized by eliminating the filamentous keratoconjunctivitis sicca (KCS) and superior limbic keratoconjunctivitis (SLK) are the most frequent causes.
- If symptoms are severe or if the above treatment fails, then bandage soft contact lens may be needed. The soft lens protects the epithelium from the lids.
- Since some bandage lenses have low Dk and limited oxygen permeability, it is recommended that the corneas be evaluated within 24-48 hours to look for edema or corneal breakdown. If a lens is needed for several days or weeks, an extended wear lens is recommended.
Follow-Up for Filamentary Keratopathy

- Check in 1-4 weeks.
- Fortunately, most cases respond to conventional therapy.
  - Many generally respond well to hypertonic agents and artificial tears.
  - For those who do not respond to conventional treatment, may want to try a mucolytic agent (FDA has not approved for ocular use) or a bandage soft contact lens.
  - The contact lens usually provides a dramatic clinical improvement, but this is not the best approach for all cases.

- The prevention of further filament may require long-term use of a tear supplement. Lubrication must be maintained chronically if the underlying condition cannot be eliminated.

- Manage primary condition appropriately and avoid risk of recurrence.
Floppy Eyelid Syndrome

Definition/Incidence

- A chronically red, irritated eye, often worse upon awakening.
- A mild mucous discharge
- A soft rubbery texture
- A superior tarsal papillary conjunctivitis
- Superior tarsal puncta keratoconjunctivitis
- The patient is typically older

NOTE: The symptoms are thought to arise from the spontaneous eversion of the upper eyelid during sleep. The eversion allows the superior palpebral conjunctiva to rub against a pillow or mattress.

Differential Diagnosis

Vernal conjunctivitis
- Click on a specific disease
  - Vernal conjunctivitis
  - Giant papillary conjunctivitis
  - Superior limbal herpetic conjunctivitis
  - Toxic herpetic conjunctivitis

Vernal conjunctivitis presents with large conjunctival papillae referred to as "cobblestone" papillae under the upper eyelid. It is generally a seasonal disease and is related to hay fever. It is characterized by a "papillary reaction" and is not a chronic condition. An example of this is cylindrical eversion which presents with large conjunctival papillae along the limbus. Eversion of the upper eyelid is necessary to make this diagnosis.

Critical Signs

- A diffuse papillary conjunctivitis
- An upper eyelid which can be everted easily without the use of a finger or cotton-tipped applicator exerting counter pressure
- A soft rubbery tumor that can be folded on itself

Work Up

1. Pull the side of the upper eyelid toward the patient's forehead and watch to see if the eyelid spontaneously events or is abnormally lax.
2. Perform a slit-lamp evaluation of the cornea and conjunctiva with fluorescein staining.

Treatment

1. Topical antibiotics or lubricants for any mild corneal or conjunctival abnormality (e.g., erythromycin ointment 2-3 X/day for 3-4 weeks, thenRefresh PM ointment 2-3 times a day when corneal pathology resolves)
2. The eyelid should be taped closed during sleep, or an eye shield can be worn, to prevent the eyelid from rubbing against the pillow or mattress. The patient should be instructed to refrain from sleeping face down on the pillow or mattress.
3. If the case is severe enough, an eyelid tightening surgical procedure can be performed. This is usually the definitive means of treatment.

Follow Up

The patient should be followed every 2-3 days at first and then every few weeks to monitor as the condition stabilizes.
Etiology of GPC

- The etiology is not completely understood.
- Giant papillary conjunctivitis is thought to be a specific conjunctival inflammatory reaction to denuded patches which become adherent to the anterior surface of both rigid and soft contact lenses. There may be two possible inflammatory responses:
  1. Type I: immediate
  2. Type IV: delayed
- Giant papillary conjunctivitis can also be initiated by mechanical trauma caused by patients rubbing their eyes to relieve the common symptom of itching.

Symptoms of GPC

- The symptoms reported by the patient may include:
  1. Itching
  2. Burning, stinging
  3. Foreign body sensation
  4. Lesions that may not appear
  5. Mucous discharge (more prominent nasally)
  6. Flattened vellus due to the lens deposits and mucus
  7. General lens intolerance (decreased wear time)
- Obtain a history of the lenses including: details of contact lens use, the age of the lenses, and the cleaning and storage regimen used.

Other Signs of GPC

- Contact lens deposits
- A high riding lens that will not remain centered
- Mild conjunctival injection
- Transient appearance to the conjunctiva
- Superficial punctate epithelial staining in some severe cases
- Conjunctival hyperemia and edema


critical Signs Contributing Factor

- Lesion deposits
- Increased wearing time (e.g., extended wear)
- Other lenses / larger lenses
- Tinted or white lenses
- Individual activity of the lens type (e.g., material)
- Allergic history (e.g., asthma, allergies, allergies, etc.)
- Patient age
- Generalized predisposition

Primary Goal in Treating GPC

- The main goal is to treat GPC to allow continued comfort, corneal health, and to limit the inflammatory response.
- The treatment requires a systematic approach. The main emphasis in this approach is to keep the inflammatory response to a minimum to make the patient as comfortable as possible.

- Never promise success to the patient.
Management of GPC

- New contact lenses with the same parameters and design.
- Different soft lenses (e.g., C5I)
- Disposable lenses:

  OPTIONS:
  - wear the lenses for 2 weeks and then throw them away.
  - wear the lenses for 1 week and then throw them away.
  - clean the lenses every night, store them every 3 days, and then throw them away after 1 week.
- Rigid gas permeable lenses:

  ADVANTAGES:
  - less surface to attract deposits
  - better edges
  - easier to care for

Follow up for GPC

The patient should be evaluated every 2-4 weeks noting their progress. Once the symptoms have been extinguished, slowly taper the use of Cromolyn sodium.

NOTE: GPC can also result secondarily to an exposed osule of an ocular prosthesis or post cataract surgery. If this is the case, the prosthesis should be removed and then treated with Optiron 2% qid until the symptoms have resolved.

Cromolyn sodium (Optiron) has been pulled from the market and the chances of it returning are very slim according to the manufacturer. However, Levocabastine is a new drug to be used in the treatment of allergic conjunctivitis. It has an antihistaminic action that is more effective than Cromolyn sodium in stopping redness, itching, tearing and swelling and is FDA approved. It is also expected to receive approval in 1992.
Primary vs Secondary Infection

- **Primary HSV keratitis:** usually occurs in infants and young children, and is rare in adults, although incidence is increasing with increasing HIV/AIDS infections.
- In the recurrent cases, there is often a history of previous attacks. This is helpful in making a diagnosis.
- Several of the aggravating or inciting factors are as follows:
  - sunlight, trauma, extreme heat or cold, fever, Crohn's disease, surgery, and epilation.
- This program concentrates mainly on the treatment of the primary infection and suggests consultation for the recurrent form, especially if keratitis is not limited to the epithelium.

Definition and Incidence of Herpes Simplex Keratitis

- A dendritic epithelial keratitis or ulceration is normally produced as an acute or chronic disease by infection of herpes simplex virus type 1 (HSV-1). HSV-2 can also be the cause. Acute follicular conjunctivitis and skin lesions are commonly present.
- HSV keratitis remains the leading cause of corneal blindness in the U.S. (responsible for more than 1.5 million cases per year).
- Primary infection occurs in 70-80% of the population between the ages of 3-5, and by the age of 15, 90% of the population is infected systemically.
- Infection usually results from contact with infected individuals by means of saliva and sexual contact, but also from active skin lesions.

Symptoms of Primary Herpes Simplex Keratitis

Primary Herpes Simplex Keratitis

- **Symptoms** (uncommon in first 6 months of life):
  - Generally infants and young children (ages 5-15).
  - Symptoms usually appear 2-12 days after initial contact with infected person. They include:
    - Mild malaise and fever.
    - Lid edema may be present.
    - Red eye (both conjunctivitis and stinging are generally unilateral and rarely severe, but the eye may be slightly painful during the first attack.
    - Skin lesions are common. Chief concerns may be the skin lesions next to the eye.
    - Mild redness.
    - Generally all ocular symptoms are unilateral.
- Within 3 weeks, 50% of patients will develop corneal lesions (epithelial). Keratitis, photophobia, and blurred vision are common.

Symptoms of Recurrent Infection

- **Symptoms**:
  - **Keratitis:** Always associated with a stromal or interstitial form.
  - Always unilateral.
  - Follicular conjunctivitis.
  - Moderate to severe bilateral hyperemia with occasional conjunctival hemorrhage.
  - Spontaneous pustular conjunctival lymph node may be slightly enlarged and tender.
  - Discharge (clear tear break up time).
  - Dendritic keratitis (more common) or ophthalmic (trophic) keratitis.
  - Corneal hypesthesia.
  - Neurotrophic ulcer.
  - Corneal stromal lesions.
  - Necrotizing interstitial keratitis.
  - Dendritic keratitis.

Work-up

- **Corneal Lesions**
  - **Signs**
  - **Diagnosis**
  - **Follow-up**
Diagnosis for Herpes Simplex Keratitis

- Roseola
- Herpes Zoster Ophthalmicus
- KP
- IBC
- Chlamydia
- Recurrent corneal erosion
- Bacterial infections
- Contact lens related pseudodendrites

All of the above are covered in this program.

Signs

Work up for Herpes Simplex Keratitis

- Slit lamp examination with IOP measurements.
- Look for an acute follicular conjunctivitis.
- Epithelial involvement.
- Dendrites? Unilateral or bilateral?
- An ulcerative dendrite will be degraded versus an infiltrative dendrite which is raised. Fluorescein will outline a dendrite versus a shedding ulcer over a infiltrative dendrite.
- Immune or discontinue keratitis.
- Anterior chamber reaction? Check before using NaF.
- Test for central hypopyon.
- Hypopyon develops and increases with each recurrent attack.
- Use a separate qid for each eye.

General Tx

Clinical features of Primary Herpes Simplex Infection

Confirmatory Lab tests if diagnosis in doubt

General Treatment for HSV Keratitis

- No steroids in an epithelial keratitis.
- Skin lesions can be treated in a variety of different ways:
  - Mupirocin ointment and treated with Acyclovir
  - Antimicrobial ointment (bacitracin or erythromycin)

Skin lesions: *

- Antiviral therapy (Viroptic) for keratitis/conjunctivitis
- Need to be tapered due to toxicity but continue several days after epithelial healing. If ineffective after 1 week, switch to another.

- Supportive systemic therapy - ad lib (neomycin, polymyxin etc.)
- Hot compresses (ad lib)
- Cyclopentolate if eyelid inflammation.
- Co-analgesics with narcotics or primary physician if primary HSV keratitis
- In recurrent cases consult with ophthalmologist.

Treatment of Fusidic/Skin involvement

- Warm compresses in skin lesions qid for 2-14 days
- If mupirocin is involved:
  - Mupirocin (Vaprin) 1% drops 5% per day
  - Vidarabine (Vira-A) 5% per day
- Topical antibiotic if lesions become infected (bacitracin or erythromycin)
- Topical acyclovir (Viroptic) qid for 7-14 days
- Acyclovir is expensive and has not been proven effective. It is not approved for epithelial use.

Treatment of Neurotrophic ulcer

- Occlusive lubrication for mild punctate epithelial staining:
  - Artificial tears (Codiaeum qid) q 2 hours and
  - Artificial tear ointment (Refresh) PM qhs.
- If small corneal epithelial defect is present then use erythromycin ointment and pressure patch for 24 hrs.
- If corneal ulcer is present, refer to ophthalmologist or corneal specialist.

Follow-up

Follow-up

Follow-up

Follow-up

Work up for Herpes Simplex Keratitis

- History:
  - Has the patient had any previous episodes?
  - History of a corneal abrasion?
  - Contact lens wearer? What type? What care system?
  - Has the patient recently been on topical or systemic steroids?
  - Any previous nasal, oral, or genital sore?
  - Immune deficiency state?

- Visual acuity (Snellen in feet).

- External examination:
  - Skin lesions typically involve the lids and periorbital area. If present, note site and location. Initially, these consist of vesicles which rapidly form superficial crusts and then heal without scarring.

- DDDs

More
Follow up for Primary Herpes Simplex Keratitis

- With prolonged treatment, the antiviral can produce a punctate keratopathy, retardation of epithelial healing, superficial stromal opacification, follicular conjunctivitis, or bacterial punctate ulceration.
- If epithelial defects do not resolve after several weeks, suspect neurotrophic ulcer or antiviral toxicity. Contact...
  - Generally at this point, antivirals will be stopped.

Be aware of complications:
- Bacterial or fungal infection
- Secondary preseptal cellulitis
- Stromal involvement
- Advise patient or patient’s parents on recurrence risks
- Routine checks or PRN

Follow up for Herpes Simplex Keratitis

- Patient should be examined in 2-3 days to evaluate response to therapy. Recheck every 3 days until comes is clear and every 5 days until skin lesions resolve.
- Evaluate the following:
  - Size of epithelial defect and ulcer
  - Corneal thickness and depth in which ulcer is involved. If stroma is involved, it is best to get corneal specialist consultation.
  - Anterior chamber reaction and IOP
- Antiviral medications for corneal dendrites and geographic ulcers should be continued 5-7x daily for 10-14 days. 90% of epithelial dendrites heal within 34 days or less without scarring.
- Topical steroids, if used for anterior disease, are tapered slowly over months to years.
- Prophylactic antiviral agents are used tid. No antiviral is needed when stromal is given once a day or less.
Herpes Zoster Ophthalmicus

Main Menu
- Critical Signs
- Symptoms
- Signs
- Differential Diagnosis
- Work-up
- Treatment
- Follow-up

Symptoms of Herpes Zoster Ophthalmicus

Any or all of the following may be present:
- Acute skin rash
- Moderate to severe pain
- Red eye
- General malaise, fever and/or chills
- Headache
- May have blurred vision

Differential Diagnosis

- The ocular involvement is variable and can mimic many anterior segment diseases
- Herpes simplex keratitis
  - In this case, the rash will not respect the midline or follow a dermatome.
  - The keratitis will stain well with fluorescein and have true end buttons in HSV keratitis. To Herpes Zoster, there is poor staining of the dermato.
  - Patients with HSV are typically younger than those with Herpes Zoster.
  - See Herpes Simplex Keratitis of this program. There could be an overlying HSV infection.

Work-up for Herpes Zoster Ophthalmicus

- Core List:
  - How long has there been a rash and pain associated with it?
  - Any risk factors for AIDS Immunocompromised? Cancer?
  - Visual acuity
  - Check for sensory (generally greatly reduced)
  - SLE:
    - Fluorescein staining
    - IOP
  - DFE:
    - Check for any posterior involvement.
  - Medical evaluation may be helpful in determining if patient is immunocompromised.

Treatment of Herpes Zoster Ophthalmicus

- Medical, dermatological and ophthalmic specialists are indicated, depending on severity.
- Therapy may include all or any of the following, depending on severity:
  - Oral antiviral (acyclovir, ganciclovir, foscarin)
  - Systemic steroids if patient immune system is compromised or severe.
  - Topical antivirals
  - Topical steroids (corticosteroids)
  - Topical antibiotics
  - Clotrimazole (Tizanid)
  - Cool compresses
  - Oral analgesics
  - Steroids (oral and/or topical)

Follow-up of Herpes Zoster Ophthalmicus

- Patients should be followed every 1 to 7 days depending on severity, if ocular involvement is present.
- Advise patient of symptom recurrence, recurrent neuralgia, and permanent scarring risks.
- Zoster is contagious to all those who have not had chicken pox.
- Patients should be followed every 6 months after initial acute attack.
Hyperacute Conjunctivitis

**Signs and Symptoms of Hyperacute Conjunctivitis**
- Cephalic mucopurulent discharge
- Generally accumulates in the lower cul-de-sac and overflows at the inner canthus
- Intermittent blurring of vision secondary to the conjunctival discharge
- Conjunctival hemorrhages
- Base can range from pinpoint (small dot) to larger areas of gross subconjunctival blood
- Conjunctival papillae
- Chemical
- True or pseudomembranes may develop in the fornices and/or on the pulpal conjunctiva
- Foreign body sensation
- Lid edema and erythema
- Tenderness of the globe presenting as a throbbing pain
- Frequent follicles and preauricular lymphadenopathy or enlargement may occur, mimicking a viral presentation

**Work-Up for Hyperacute Conjunctivitis**
- Laboratory workup is indicated:
  1. Conjunctival scrapings for culture and sensitivity:
     - Blood agar, chocolate agar (37°, 10% CO2) and Thayer Martin plates
     - Immediate Gram stain
  2. Always consider the risk of central invasion of hyperacute bacteria through an intact cornu.

**Differential Diagnosis of Hyperacute Conjunctivitis**
- Possible organisms to consider:
  1. *Streptococcus pneumoniae* - usually bilateral, dense hemorrhage, and associated with preseptal cellulitis.
  3. *Nocardia asteroides* - presents as rapid proliferation, extremely purulent discharge, and a positive venereal history.
  4. *Pseudomonas* - often secondary to injury and usually central involvement

**Treatment of Hyperacute Conjunctivitis**
- Initiated if the results of the gram stain show gram negative intracellular diplococci or there is a high suspicion of a clinical pneumococcal infection. The therapeutic regimen is as follows:
  1. Obtain conjunctival culture and scrapeings. It is very important to institute treatment prior to obtaining the culture results.
  2. Irrigation of the eye with saline qid until the discharge is eliminated.
  3. Topical bacteriostatic or antiseptics antibiotic qid until resolution.
  4. If the conjunctival culture confirm *Nostococcus* species, proceed with the following:
  5. Hospitalization is advised and systemic therapy is recommended.
  6. Systemic therapy for the adult consists of three forms:
     - *Ampicillin* erythromycin 600 mg every 6 hours or 1 g from 1 gm penicillin 500 mg PO qid for 14 days. This mode of treatment is used if the patient is sensitive to penicillin.
Ocular Pemphigoid

Main Menu
Definition/Incidence
Symptoms
Ocular Signs
Systemic Signs
Critical Signs
Work Up
Differential Diagnosis
Treatment
Follow Up

Symptoms of Ocular Pemphigoid
- Incisive onset of redness
- Foreign body sensation
- Photophobia
- Tearing

Systemic Signs of Ocular Pemphigoid
- Mucous membrane vesicles of the nose, oral cavity, pharynx, larynx, esophagus, anus, vagina, or urethra
- Demed epithelium and scarring which can lead to strictures of the esophagus, anus, vagina, or urethra
- A desquamative gingivitis in the mouth is common
- Vesicles and bullae may also be noted on the skin with erythematous plaques or scabs near the affected mucous membrane

Work Up for Ocular Pemphigoid
- History: Is the patient on any chronic topical medications?
- Has there been an acute onset of illness in the past?
- Skin and mucous membrane (especially the mouth) examination.
- slit lamp examination, especially looking for inferior symblepharon. Pull down the patients lower eyelids and have them look up.
- Check the intraocular pressure.
- Dermatology; ear nose and throat; gastrointestinal; and pulmonary consults, if needed.
- Gram's stain and culture of the conjunctiva if a secondary bacterial infection is suspected.
- Consider a conjunctival biopsy for immunofluorescence studies.

Definition and Incidence of Ocular Pemphigoid
- Ocular pemphigoid is a subepithelial bullous disease of the aged affecting the mucous membranes leading to shrinkage, scarring, and adhesions. When the conjunctiva is involved, normal tissue is replaced by scar tissue (scarification).
- A history of trauma combined with the observation of persistent dry spots on the cornea should alert the clinician to a possible mucin deficiency.
- Ocular pemphigoid may begin with a typical dry eye complaint in the elderly patient. The continual conjunctival shrinkage and scarring can lead to symblepharon formation with an entropion and trichiasis, lagophthalmos and exposure dermatitis, and the inability to elevate the eyes.
- The incidence of ocular pemphigoid is very low (1 in every 20,000 patients). Women are affected more than men in a ratio of 7:1. The average age of presentation is over 60 years and there is no racial predilection.

Ocular Signs of Ocular Pemphigoid
- Superficial punctate keratitis
- Secondary bacterial conjunctivitis
- Corneal scarring
- Increased intraocular pressure
- Poor tear film
- Entropion
- Trichiasis
- Corneal scarring with puncta and keratinisation
- Recurrent corneal erosions
- Corneal neovascularisation
- Psedopterygium
- Obstruction of the nasolacrimal duct and restriction of ocular motility

Critical Signs for Ocular Pemphigoid
- Inferior symblepharon - linear folds of conjunctiva connecting the palpebral conjunctiva of the lower eyelid to the inferior bulbar conjunctiva.

Differential Diagnosis of Ocular Pemphigoid
1. Stensen-Johnson Syndrome - Usually presents as an acute onset of redness often accompanied by fever and malaise. The ocular involvement is similar to that of ocular pemphigoid, presenting with symblepharon and entropion with trichiasis. The differentiating sign with Stensen-Johnson syndrome is that the eye is typically swollen and crowded, and the 'target' lesions of the skin (red centers surrounded by a pale halo) are often found. Stensen-Johnson syndrome is also a self-limiting condition in which the conjunctival shrinkage and symblepharon is mild, unlike the chronic progressive course of ocular pemphigoid.
2. Membranous conjunctivitis - Usually subacute or less intense symptoms that can occur with or without scarring. Symblepharon can follow with severe presentations.
3. Sjogren Chemical Burn - chemical burns can generally be elicited through an extensive case history, however, the signs will be epithelial defects emerging from scattered 80% to focal epithelial loss in staining of the entire epithelium.
4. Chronic topical medication - e.g., ophthalmic, pheochrom or arterial agents.
Treatment of Ocular Pemphigoid

- As in any tear filament deficiency, the treatment of mucin-deficient dry eye with ocular pemphigoid is mainly with artificial tears (e.g., Cellebrate 4-10X/day). Vitamin A drops are extremely beneficial in the prevention of epithelial growth and differentiation. The main goal is to maintain patient comfort rather than attempting to halt the progression of the disorder. Frequent instillation of an artificial tear preparation at bedtime may be particularly useful in managing mild cases.

- In addition to the basic disease process, secondary bacterial infections (blepharitis) may complicate the clinical problem. In such cases, lid scrubs followed by antibiotic ointments (bacitracin lid) have shown to be effective.

- Timolol has been shown to exacerbate ocular pemphigoid. It is recommended that increases in the IOP levels should be managed with carbonic anhydrase inhibitors.

- Disruption and cicatrization can be corrected with surgical methods in their early stages but special care needs to be taken not to further abrade the already atrophied conjunctiva.

- Systemic steroids (prednisolone 40 mg po q day) for preventing acute exacerbations.

Follow Up for Ocular Pemphigoid

- Every 1 - 2 weeks in acute exacerbations.
- Every 1 - 3 months during remissions.
Definition of Ocular Rosacea

Ocular Rosacea is a common chronic skin disorder of unknown etiology.

- It is more prevalent in females and usually manifests between the ages of 30 to 50 years. It also tends to be more prevalent in the Irish population.
- Characteristically, the nasal skin area (nose, cheeks, and bridge) and the V of the neck is involved.
- The presence of telangiectatic vessels and rhinophyma is diagnostic of rosacea.

Symptoms of Ocular Rosacea

- Bilateral erythema of the eyelids
- Burning
- Foreign body sensation
- Tearing
- Photophobia

Signs of Ocular Rosacea

- Rhinophyma of the nose
- Telangiectasias of the eyelid margins
- Cheilitis
- Malar hyperemia or acne are common
- Conjunctival injection (congestion)
- Punctate epithelial erosions
- Peripheral vascularity
- Subconjunctival infiltrates with normal thickness
- Corneal perforation may occur secondary to the inflammation and thickening

Differential Diagnosis of Ocular Rosacea

- Harpies: simple keratitis (usually unilateral; the blepharitis is often bilateral but may appear similar; the face lines of rosacea are generally absent)
- Dry eye syndrome - SPK results from a poor tear film or a decreased TRT
- Malar rosacea - presents as erythema, telangiectasia, and crusting of the eyelid margin
- Bacterial keratitis - SPK results from poor tear film and a failure of the lid to cover the entire globe
- Tolosa-Hunt syndrome - SPK results from deep infections, causing a hyperpigmentation reaction
- Uveitis - usually bilateral - SPK often seen in worms or from an injury
- Contact lens-related problems - SPK from chemical toxicity, tight lens syndrome, contact lens overuse, PTC etc.
- Tolosa-Hunt syndrome - bilateral with hemorrhage SPK in the absence of conjunctival injection
- Fuch's glycogenation - the SPK are typically linear appearing on flow
- Trachoma - SPK are typically linear from an eyelid rubbing on the eye

Treatment for Ocular Rosacea

1. Tetracycline 250 mg po qd x 3 - 6 weeks. With patients that exhibit a cornea - injection to teriacystina, such as a patient with ocular chondroplasia, ankylostom in the eye damage and duration may be increased. Once the relief of symptoms becomes evident, slowly taper the dose over a couple of weeks.
2. Some patients may also experience an associated blepharitis which can be treated with an antibiotic (e.g., bacitracin-polymyxin B) tidserialization at bedtime.
3. Treatment of ulcers:
   - Warm compresses for 15-20 minutes qid in conjunction with light massage over the lesion
   - For more severe cases, consider a topical antibiotic (e.g., bacitracin or erythromycin tig)
4. If small corneal perforations are present, they may be treated with sutures while larger ones may require surgery
5. If the SPK arise with blepharitis, blepharitis, and/or antibiotic treatment may be necessary
Follow Up for Ocular Rosacea

The follow up for Ocular Rosacea is variable depending on the severity of the disease.

- Patients **without** canal involvement should be followed every 4-6 weeks.
- Patients **with** canal involvement should be followed more frequently.

**It is important to counsel these patients since this disease may be a chronic condition and some signs of dermatitis or blepharitis may persist after most of the symptoms are relieved.**
**Orbital Cellulitis**

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**Main Menu**
- Critical Signs
- Symptoms
- Signs
- Differential Diagnosis
- Work Up
- Treatment

---

**Symptoms of Orbital Cellulitis**
- Acute to subacute presentation
- Swollen lids
- Moderate to severe pain
- Red eye
- Occasionally, patient may suffer from general malaise.
- Headache
- May have blurred vision
- Patient may have diplopia

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**Critical Signs of Orbital Cellulitis**
- Progressive lid edema
- Erythema (usually a deep, dark purple-red color)
- Lid is tender and warm upon palpation
- Proptosis
- Restricted, painful ocular motility

---

**Signs of Orbital Cellulitis**
- Conjunctival injection
- Moderate to severe abomasum
- Retinal venous congestion (possibly)
- Optic disc edema (possibly)
- Purulent discharge
- May have abnormal papillary reaction
- May have reduced corneal sensation

---

**Differential Diagnosis of Orbital Cellulitis**
- Stomatitis (especially in children)
- Infection (staph, strept, hemophilus, fungal)
- Anterior venous fistula (i.e. carotid-cavernous fistula)
- Cavernous sinus thrombosis
  - Discoloration and sluggish pupil, palsies of CN III, IV, VI
  - Usually unilateral
- Pneumo-pneumonia
  - Note of the following: diplopia, restriction in ocular motility, proptosis, conjunctival chemosis
- Trauma
- Metastasis

---

**Work-Up for Orbital Cellulitis**
- Case history?
- Sinusitis?
- Malaise (fever, chills, headache?)
- Trauma? Diplopia?
- Check for proptosis: Normal limits?
- Check pupils, ophthalmoscopically.
- Differentiate from other orbital diseases and periorbital cellulitis.
- Refer to medical practitioner immediately if suspect orbital cellulitis. This condition usually requires hospitalization and is life threatening.

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**Treatment of Orbital Cellulitis**
- REFER TO MEDICAL PRACTITIONER
- Therapy may include all or any of the following:
  - Antibiotics
  - Parenteral therapy
  - Drainage of abscess
  - IV antibiotics up to 1 week
- Follow up should include same day verification of referral and care.
**Etiology of Perinnaud's Oculoglandular Conjunctivitis**

- Cat scratch disease - a history of being scratched by a cat within 2 weeks of the onset of symptoms
- Tularaemia - a history of contact with rabbits, ticks, or other wild animals
- Tuberculosis and other mycobacteria
- Syphilis

**Symptoms**

- Odans includes:
  - a. Lymphoma
  - b. Lymphoma
  - c. Mononucleosis
  - d. Dengue
  - e. Syphilis
  - f. Coccioidomycosis

**Work Up for Perinnaud's Oculoglandular Conjunctivitis**

- Laboratory testing should include:
  1. Conjunctival scraping for Gram's, Giemsa, and acid-fast stains
  2. Blood, Lowenstein-Jensen, and tuberculosis cultures
  3. CBC, ESR, ETO AFS
  4. Bacterium serogroup/nuture test (SST)
  5. Chee X-ray if tuberculosis or escherichia coli is suspected
  6. Specific skin tests (Kleiner-Rose test, PPD, and PPD test)
  7. If tuberculosis is suspected, serologic tests are necessary

**Treatment of Perinnaud's Oculoglandular Conjunctivitis**

1. Warm compresses for tender lymph nodes.
2. Analgesics as needed.
3. If ocular involvement only, treat with a broad-spectrum antibiotic (e.g., gentamicin) q-4h until resolution of acute ocular symptoms.

**For treatment of specific etiologies:**

1. Cat scratch disease
2. Tularaemia
3. Tuberculosis
4. Syphilis

**Follow Up for Perinnaud's Oculoglandular Conjunctivitis**

- Repeat the ocular examination in 1-2 weeks.
- The patient should be informed that the presellar lymphadenopathy can persist for weeks to months.
Phlyctenulosis

Main Menu

Etiology
Symptoms
Critical Signs
Differential Diagnosis
Work Up
Treatment
Follow Up

Etiology of Phlyctenulosis
Phlyctenulosis is an inflammatory condition characterized by the development of a conjunctival or corneal nodule. The presenting nodule is a direct result of a nonspecific delayed hypersensitivity reaction to foreign protein. Phlyctenulosis is most common in children, typically affecting infants, with a higher incidence in females. It is usually unilateral in presentation with an acute or subacute onset of symptoms. Some of the common etiologies are listed below:

- Infection (often related to blepharitis)
- Tuberculosis
- Acne Rosacea Keratitis
- Other infectious agents elsewhere in the body

Symptoms of Phlyctenulosis

- Itching
- Busing
- Irritation or pain
- Miosis or sever photophobia
- Foreign body sensation
- "Sticky" or "gelatin" feeling
- Mucopurulent discharge
- Conjunctival injection
- A history of similar episodes

Phlyctenulosis

- A small white nodule on the bulbar conjunctiva, in the center of a hyperemic area. Often times, this will occur at the limbus.
- A small white nodule, initially at the limbus, bordered by thickened blood vessels which migrate around the center of the cornea, producing a vascular ring and ulceration, often bilateral.

Differential Diagnosis of Phlyctenulosis

- Herpes simplex keratitis
- Inflamed pingueculum
- Small pterygium
- Infectious corneal ulcer
- Ocular rosacea
- Herpes simplex keratitis
- Vernal conjunctivitis

Treatment for Phlyctenulosis

- Topical steroids (e.g., prednisolone acetate 1%) is relatively high doses (qid for 3-4 days) to "treat" the illness quickly minimizing the risk of anterior uveal scarring
- Phenytoin sodium (e.g., 10 mg/kg/day)
- Artificial tears (e.g., Refresh drops) 4-8 times a day
- If severe photophobia is present a cycloplegic may increase patient comfort.
- If severe blepharitis, use tetracycline 250 mg po qid
- If PPD or chest x-ray is positive for TB, refer to internist for work up
- If control corneal scarring, penetrating keratoplasty may be of benefit
Follow-Up care for Phlyctenulosis

- Recheck within 3-5 days depending on the steroid dosage.
- The phlyctenulus should show quick response and reversal. If not, increase the dosage of the steroid. Upon improvement, continue the steroid until complete resolution of the raised lesion and total resolution of scarring (anterior stromal) have been observed. Often, permanent anterior stromal scarring/hazy scar will persist with or without overlying pannus.
- Maintain antibiotic use for 3-5 weeks after discontinuing the steroid.
- Continue eyelid hygiene indefinitely.
- Use artificial tears as needed.
Pterygium

Main Menu

Symptoms

Signs

Critical Signs

Differential Diagnosis

Treatment

Follow Up

Symptoms of a Pterygium

- Occular irritation
- Conjunctival hyperemia
- Foreign body sensation
- Reduction of vision

Critical Signs of a Pterygium

- A wing-shaped field of infiltrative tissue arising from the interpapillary conjunctiva and extending onto the cornea.

Differential Diagnosis of a Pterygium

1. Conjunctival Infiltrative Nodules: Presence of a unilateral or bilateral papillary nodule of the conjunctiva.
2. Dermoid: A congenital white lesion, usually involving the limbus. It is often associated with a deformity of the eyelid, such as coloboma.
3. Pterygium: A white, triangular, vascular tissue growing into the cornea, usually originating from the nasal side of the eye.

Treatment of a Pterygium

1. Prevent the eye from sun, dust, and wind (e.g., sunglasses or goggles) or sunlight and chronic irritation are thought to be factors in the growth of pterygium.
2. Reduce the ocular irritation if present:
   - Mild: Artificial tears (e.g., Refresh 4-8 X/day) and/or a mild topical vasoconstrictor (Naphcon A id - 4/6).
   - Moderate to Severe: A mild topical steroid (e.g., Fluorometholone 1/6 - 4/6).
3. If a corneal lesion is present, then apply artificial tears intermittently (e.g., Refresh PM) and protect the eye with an occlusive shield for 2 weeks.
4. Surgical removal may be indicated when:
   - The lesion is interfering with contact lens wear.
   - The patient is experiencing extreme irritation that is unrelieved with the above treatment.
   - The pterygium involves the visual axis.

Follow Up for a Pterygium

1. Measure and diagram the lesion. Photodocumentation is recommended.
   - Redo checks of pterygium in 6 - 12 months.
   - Longstanding lesions are usually stable.
2. If treating with a vasoconstrictor, then the patient should be followed in 2 weeks. The dose may be decreased when the inflammation has subsided.
3. If treating with a steroid, then follow the patient every 2 weeks, monitoring both the inflammation and intraocular pressure. Taper and discontinue the steroid over several days once the inflammation has resolved.

Main Menu
Scleritis

Symptoms of Scleritis
- The most prominent feature is severe and burning ocular pain.
- The pain may radiate to the forehead, jaw or brow and may awaken the patient during the night.
- Red eye
- Tears
- Photophobia
- Insidious decrease in vision.
- Recurrent episodes are common. There is no discharge.

Definition and Incidence of Scleritis
- Unlike episcleritis, scleritis is relatively rare and has a gradual onset.
- It affects females more than males with a peak incidence in the 4th to 6th decade.
- Scleritis is bilateral 50% of the time with 2/3 of the cases occurring simultaneously in both eyes.
- Scleritis always produces a concurrent episcleritis.

Classification of Scleritis
- Diffuse:
  - Commonly associated with collagen vascular diseases (i.e., rheumatoid arthritis), herpes zoster and gout.
- Nodular:
  - 15% of the cases
  - Most frequently associated with herpes zoster
  - Nodule is immovable, tender to the touch; the sclera below the nodule does not become ischemic.
- Necrotizing: Scleromalacia perforans may also be present.
  - 14% of the cases (a more severe type) -> 20% of patients are dead within 5 years
  - Sclera is well vascularized and endocardial inflammation is present.
  - Sclera becomes translucent and underlying choroid can be seen.
  - Ocular and systemic complications 60% of the time other than scleral thinning
- Scleromalacia perforans (progressing with little or no inflammation):
  - Generally, with longstanding cases of rheumatoid arthritis.
  - There is generally no pain and almost no other symptoms.
  - "Melting" of the episcleira and sclera.

Critical Signs for Scleritis
- The hallmark symptom is severe pain.
- Inflammation of arterial, episcleral and conjunctival vessels - can be sectorial or diffuse.
- The sclera has a characteristic bluish hue (best seen in natural light) and may be thin or edematous.

Other Signs Associated With Scleritis
- General changes occur in 70% of cases:
  - peripheral iritis
  - iridocyclitis
  - keratitis
  - uveitis (occurs in 50% of cases)
  - Scleral thinning (occurs in 20% cases)
  - Glaucoma (occurs in 15% of cases)
  - Scleral nodules (non-mobile)
  - Exudative retinal detachment
  - Sub-conjunctival hemorrhage
  - Cystoid
  - Proptosis (posterior scleritis)
  - Rapid onset of hyperopia (posterior scleritis)

Differential Diagnosis
- Episcleritis:
  - The sclera is not involved in episcleritis.
  - Episcleritis is generally not as painful.
  - Generally, there is sectorial injection vs. a blush diffuse injection in scleritis.

Work-Up of Scleritis
- Medical history
  - Have there been any other episodes?
  - Any medical problems? There is a high association with many systemic disorders.
  - It is important to examine the sclera in natural light. Often there will be a bluish hue in natural light.
  - Use of a red filter to determine if vascular areas of the sclera exist.
- DIF is not if any posterior involvement.
- Refer to internist or rheumatologist for complete physical examination.
### Treatment of Scleritis

- Refer to Ophthalmologist.
- Steroids
  - Topical steroids increase comfort but many times are not enough. Therefore, systemic steroids are highly recommended especially in severe or necrotizing scleritis.
  - Subconjunctival steroids are not recommended.
- Nonsteroidal anti-inflammatory agents (NSAIDs)
  (e.g., Oxyphenbutazone, Indomethacin, Naprosyn)
- Immunosuppressive drugs in severe or necrotizing cases.
- Surgery is indicated in some cases.
- No scleral treatment is available for scleromalacia perforata. Refer to rheumatologist.

### Follow-up of Scleritis

- Follow-up really depends on the degree of scleritis.
- Generally a decrease in pain indicates a response to the treatment.
Stevens-Johnson Syndrome

**Main Menu**
- Etiology
- Symptoms
- Signs
- Critical Signs
- Work Up
- Differential Diagnosis
- Treatment
- Follow Up

**Etiology of Stevens-Johnson Syndrome**

Stevens-Johnson syndrome is an acute inflammatory polymorphous skin disease which may be precipitated by many agents, including any of the following:

**DRUGS**
- Sulfa drugs
- Barbiturates
- Chlorpropamide
- Thiazide diuretics
- Phenothiazine
- Sulfonamides
- Tetracyclines
- Codeine
- Penicillin

**INFECTIONOUS AGENTS**
- Various bacteria
- Viruses (e.g., herpes)
- Yeasts (e.g., Malassezia)

**Symptoms of Stevens-Johnson Syndrome**

- Fever
- Generalized malaise and asthenia
- Sore throat
- Cough
- Vascular skin rash
- Red eye

**Critical Signs of Stevens-Johnson Syndrome**

- Target lesions on the skin which appear as red central vessels surrounded by a pale ring which is surrounded by a red ring
- Hemorrhagic crusting of the lips
- Bilateral conjunctivitis

**Work Up for Stevens-Johnson Syndrome**

1. History: Attempt to determine the precipitating factor(s) [e.g., remove the antigen, treat the infection, etc.]
2. SEB: Look for periorbital edema, conjunctival injection, and mucous membrane involvement.
3. Obtain conjunctival and corneal scrapings for culture and sensitivity if an infection is suspected.
4. Obtain an electrocardiogram and a complete blood count.

**Treatment for Stevens-Johnson Syndrome**

1. Hospitalization
2. Treat the precipitating factor(s) [e.g., remove the antigen, treat the infection, etc.]
3. Systemic steroids (e.g., prednisone 1 mg/kg/d) in conjunction with an II2 blocker (e.g., Rasburicase 150 mg/dose). The duration of the steroids depends on the severity of the inflammation.
4. Systemic antibiotics (e.g., ceftriaxone 2 g every 12 hours) in conjunction with an II2 blocker (e.g., Rasburicase 150 mg/dose). NOTE: Systemic antibiotics are controversial in the management of Stevens-Johnson syndrome. If you suspect that a patient may benefit from systemic antibiotics, follow up with a specialist.
5. Blood transfusions
6. Antihistamines
7. Artificial tear drops
8. Adjuvant therapy
9. Supportive systemic care (i.e., hydration, local mouth and skin care, systemic antibiotics)

**Follow Up**
Follow up for Stevens-Johnson Syndrome

- The patient should be followed daily while in the hospital, with monitoring for the development of an infectious corneal ulcer or elevation in the intraocular pressure. When the acute phase has resolved, the patient should be seen on a weekly outpatient basis with monitoring for any long-term ocular complications, such as scarring, that may arise.

- Topical steroid and antibiotic treatment should be continued for at least 48 hours after the acute phase has resolved. The macrolides should then be tapered accordingly.

- If the conjunctiva has been severely scarred, the use of artificial tears and lubricating ointments may need to be used indefinitely.

- If trichiasis develops, cryotherapy or surgical repair may be indicated.

- Consider keratoprosthesis if the eye has been badly scarred but still shows signs of visual potential.
Ocular irritation

Slg1

A rapid coalescence of blood on the eye
typically leads to an immediate patient
response to elicit a passive biatrial u
motion or a palpable a
movement

A rapid coalescence of blood in the subconjunctival space is usually unilateral
but can present bilaterally.

A rapid onset of uniform red blood without vessel patterns (one may see streaks
of the blood spread).

Blood will typically accumulate more toward the limbus, yet there is usually a
clear space defining a visible border between the blood and the cornea.

The spread of the blood can occur in any direction, to any degree during the
first few hours or days.

Over an average of 7-21 days the blood will turn orange, to pink and back to
white. Rarely will permanent blood staining persist.

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white. Rarely will permanent blood staining persist.
Follow up for Subconjunctival Hemorrhages

- This condition usually clears spontaneously within 1-2 weeks. Patients are advised to return if the blood does not fully resolve, or if they suffer a recurrence.
- For recurrent presentations - recheck at 3 to 6 months.
- If there are more than 3 recurrences within 1 year, a full medical workup by a physician is indicated for hypertension or a bleeding disorder.
Superficial Punctate Keratopathy

Main Menu
General Information
Critical Signs
Signs/Symptoms
Etiology
Work up
Treatment

General Information
- Most equity lesions on the cornea are superficial, but there are variations in size, location and distribution. The clinician must determine the location (epithelial, subepithelial or stromal).
- Size
  - Small lesions are generally epithelial (can not be seen with slit lamp).
  - Larger lesions may be epithelial or subepithelial.
- Staining patterns
  - The distribution of the epithelial/subepithelial lesion is of diagnostic value.

Staining patterns
Common Etiologies

Common Etiologies of Punctate epithelial erosions (PEE):
- Thermal/UVE keratopathy (photochemotherapy)
- Trauma (non-specific response to injury)
- Mild chemical injury

It is common to find punctate epithelial erosions as part of the picture with almost every form of superficial corneal disturbance, but these are particularly striking in the following:
- Dry eye syndrome
- Staph blepharitis conjunctivitis
- Neoplastic keratitis
- Topical drug toxicity
- Foreign body under the lid
- Exposure keratopathy
- Contact lens related disorders

The severity of staining will help determine the etiology.

Common Etiologies of Punctate epithelial keratitis (PEK):
The conditions in italics are not covered in this program.

FINE PUNCTATE KERATOPATHY:
- Staph blepharitis conjunctivitis
- Viral keratitis
- Chlamydial
- Meismeroma corneum
- Dry eye syndrome
- Exposure keratopathy

COARSE PUNCTATE KERATOPATHY:
- Adenovirus
- Herpes simplex keratitis
- Herpes zoster keratitis
- Focinism

Critical Signs for Superficial Punctate Keratitis
- Small pinpoint epithelial defects which stain with rose Bengal or fluorescein.
- There is most likely an underlying cause.

Main menu for Superficial Punctate Keratitis
Critical signs
Etiologies
Signs/Symptoms
Some pain depends upon etiology.

Poison Ivy

Papillary Red Eye

Main with Corneal edema and infiltration can be present but are generally limited to the anterior stroma.

Treatment of Superficial Punctate Keratopathy

Non-Specific Treatment of SPK

- Antibiotic (therapeutic or prophylactic) - gentamicin or tobramycin
- Prophylactic dose (tid for 2-3 days)
- Therapeutic dose (aluminum qid for 3-7 days; depends on severity)
- Erythromycin ointment can also be used
- Non preserved lubricants are valuable (Keltiurex)
- Hypertonic drops or ointments can be used to reduce secondary epithelial edema.
- Cyclopentolate in moderate to severe cases to reduce risk of secondary anterior chamber reaction.

Non specific Rx for non-contact lens wearer
Non specific Rx for contact lens wearer

- See appropriate section to treat underlying cause.

Work-Up for Superficial Punctate Keratopathy

- Since SPK is nonspecific, the goal of the work up is to find the etiology.

Case History
- Is patient a contact lens wearer? Is there a history of trauma?
- Is the patient using any eyedrops? Is there any discharge or eyelid swelling?
- Any associated symptoms may help establish etiology (allergic itching, redness, tearing, inflammation, pain).

Staining patterns

- Early: No change
- Look at staining pattern. May also want to use rose bengal.
- Look for follicular/ papillary response in both upper and lower lid (event)
- Look at eyelid closure. May be worthwhile to inspect upper lid to search for FB.
- Evaluate tear film.
- If SPK is accompanied by infiltration or significant anterior chamber reaction, infection must be excluded. Diagnosed and treated.
- Inspect contact lenses for fit and for deposits, debris etc.
- Look for accompanying signs in the lids and conjunctiva.

Non-Specific Treatment for Non Contact Lens Wearers

MED:
- Artificial tears qid (i.e. Refresh)
- May add a lubricating ointment at bedtime (i.e. Refresh PM)
- Return if symptoms worsen or do not improve.

MODERATE TO SEVERE CASES:
- Antibiotic ointment (i.e. erythromycin ointment)
- Cyclopentolate 5% or cyclopentolate 2%
- Pressure patch for 24 hours
- After patch is removed:
  - Continue antibiotic ointment 2-3 X 1 day for 4 days

FOLLOW UP:
- Generally told to return if symptoms worsen or do not improve. Follow up based on underlying cause.

Non-Specific Treatment for Contact Lens Wearer

MED CASE:
- Artificial tears qid (i.e. Refresh)
- Lenses may or may not be worn, depending on the symptoms and the degree of SPK.
- Should be rechecked within a few days to a week, depending on the symptoms and degree of SPK

MODERATE TO SEVERE CASE:
- Discontinue contact lens wear
- Tobramycin drops 4-6 X daily and Tobramycin qid
- Consider cyclopentolate for pain (Hetromptive)

FOLLOW UP:
- Patient should be followed daily until significant improvement is seen.
- Patient should not wear lenses until condition resolves.
- Discontinue antibiotic when SPK resolves.
- If contact lenses are thought responsible, lenses or solution should be changed. See specific treatment of contact lens problem.
Superior Limbic Keratoconjunctivitis

Critical Signs for Superior Limbic Keratoconjunctivitis
- Thickening and inflammation of superior bulbar conjunctiva especially at the limbus. Rose bengal will stain superior cornea and limbal area.
- SLK is a chronic and recrudescent inflammation of unknown etiology. It affects the superior palpebral and bulbar conjunctiva and tends to run a course of months to years.

Symptoms of SLK
- Moderate to severe foreign body sensation
- Often a sharp pain is reported.
- Mild photophobia
- Tearing
- Burning
- Red eye
- Course may be chronic with exacerbations and remissions.

Other Signs of SLK
- Signs are generally bilateral but are often asymmetric.
- Fluorescein fluoresces staining on superior cornea, limbus and conjunctiva.
- Marked hyperemia of superior cornea and palpebral conjunctiva
- Papillae on superior palpebral conjunctiva
- Superior corneal micropuncta and filaments may be present
- Filamentary keratitis involving superior cornea in roughly 1/3 of the cases

Work-up for SLK
- Case history: Have there been any recent episodes?
- Visual acuity
- Slit lamp exam with fluorescein:
  - Look at superior cornea and conjunctiva
  - Look at superior limbal area
  - Front upper eyelid
- Up to 50% of SLK is associated with hyperthyroidism. May want to send out for thyroid function tests.
  - T3, T4, TSH

Treatment of Superior Limbic Keratoconjunctivitis
- If mild case of SLK, symptoms are usually eliminated with:
  - Topical lubrication (Cellufresh 4-4K daily and Refresh PM qhs)
  - Some advocate use of low dose steroids in addition to lubricants
- If moderate to severe case of SLK:
  - 1% Silver Nitrate (DO NOT USE SILVER NITRATE CAUTERY STICKS)
    - After topical anesthetic (proparacaine), apply silver nitrate with a cotton tipped applicator for 10-20 seconds to superior nasal and superior conjunctiva.
    - This treatment may need to be repeated several times (see follow up)
- If significant mucous or filaments are present, consider:
  - Acetylcysteine 20% drops (Micromist 3-5 X daily)
  - Treat dry eye or blepharitis if present.

Follow-up for SLK
- Follow up every week.
- If signs and symptoms persist, then reapply silver nitrate as weekly follow up. If the silver nitrate is unsuccessful, after 3 or 4 applications, then consider mechanical scraping, cryotherapy, cautery or surgical resection.
Symptoms of Thermal/UV Keratopathy
- Foreign body sensation
- Moderate to severe ocular pain
- Red eye
- Tearing
- Photophobia
- Altered vision
- Often a history of welding or using acetylene welder protective eyewear.
- Symptoms are typically worse 6-12 hr. after exposure.

Critical Signs
- Exposure keratopathy (poor eyelid closure)
- Nocturnal lagophtalmo - eyelid remains partially open while asleep.

Differential Diagnosis of Photokeratopathy
- Toxic epithelial keratopathy from exposure to drug or chemical (i.e., neoprene, rubber cement, antifreeze etc.)
- Exposure keratopathy (poor eyelid closure)
- Inadequate blink
- Nystagmus hypothenars - eyelid remains partially open while sleeping.
- Keratitis sicca

Symptoms of Thermal/UV Keratopathy
- Conjunctival injection
- Mild to moderate eyelid edema
- Mild corneal edema may be present
- Relatively myopic pupils which react sluggishly

Critical Signs for Thermal/UV Keratopathy
- Confluent SPE in an interpalpebral distribution.
- Fluorescein will stain the SPE

Other signs of Thermal/UV Keratopathy
- Chemical burn via ionization
- Mild to moderate eyelid edema
- Mild corneal edema may be present
- Relatively myopic pupils which react sluggishly

Work-up for Thermal/UV Keratopathy
- Case History:
  - Welding?
  - Solder? Protective eyewear?
  - Typical medications
  - Rule out toxic epithelial keratopathy from exposure to chemical or drug.
- Visual Acuity
- Slit.:
  - Fluorescein stain
  - Eyelids and search for foreign body

Treatment of Thermal/UV Keratopathy
- Cylopheptate (cyclopentate 1.0 - 2.0%) = Antibiotic ointment (erythromycin)
- Pressure patch for 24 hrs.
  - Bilateral patching is desired but most often impractical. Generally, the more severely affected eye is patched.
  - Have patient put antibiotic ointment in fellow eye at home.
  - Some also have patient patch the fellow eye upon going to sleep.
- Oral pain medication as needed and/or cold compresses to increase patient comfort
- Patient is instructed to remove patch after 24 hrs.

Follow-up for Thermal/UV Keratopathy
- If the eye feels much better the following day, patient is to begin topical antibiotics.
- If the eye is significantly symptomatic, then patient should return for reevaluation. If significant SPE is present, then re-treat with cyclopentate, antibiotic, and patch. RFC in 24 hours.
1. **Bacterial conjunctivitis** - generally present as a "mucky" red conjunctiva that increases toward the limbus. The cornea is typically clear; the hypertonic vessels will blush with a mild vasodilator, usually a papillary response and a mononuclear discharge.

2. **Chemical conjunctivitis** - generally quickly recognized typically seen in swimmers and young adults. A history of regurgitation, corneal or umbilical may be noted. Chemical conjunctivitis presents as inferior tarsal conjunctival follicles in conjunction with tiny gray-white subconjunctival infiltrates. It is generally diagnosed with conjunctival scraping and a Gram stain. The stain shows basophilic bodies in the epithelial cells, polymorphonuclear leukocytes, and lymphocytes.

**Trachoma**

- **Main Menu**
- **Etiology**
- **Symptoms**
- **Signs**
- **Classification**
- **Differential Diagnosis**
- **Critical Signs**
- **Treatment**
- **Follow Up**

**Etiology of Trachoma**

- The causative organism of trachoma is Chlamydia trachomatis.
- Trachoma tends to be an endemic in underdeveloped countries and among certain ethnic groups.
  
  a. Asia 
  b. Africa 
  c. South America 
  d. American Indians 

- Trachoma is generally spread by direct contact (hands, sexual, or cervical).

**Symptoms of Trachoma**

- Tearing 
- Photophobia 
- Mucus discharge 
- Pain 
- Lid swelling

**Diagnosis**

- Chronic follicular conjunctivitis 
- Lid edema 
- Chemosis 
- Hyperemia 
- Papillary hypertrophy may mask the follicular response 
- Linear conjunctival scarring (Arcu's line) 
- Epithelial keratitis 
- Marginal and central infiltrates 
- Superficial vascularization / Periostitis 
- Shallow corneal ulcers 
- Limbal swelling and follicles 
- Herbert's pits 
- Telangiectasia and telangiectasia in the later stages

**Critical Signs of Trachoma**

- Chronic follicular conjunctivitis that, usually, initially affects the upper tarsal plate 
- Limbal follicles and Herbert's pits are pathognomonic of trachoma

**Classification of Trachoma**

- **Stage I** - The upper tarsal plate demonstrates immune follicles without evidence of conjunctival scarring 
- **Stage II** - The upper tarsal plate demonstrates immune follicles with moderate papillary hypertrophy 
- **Stage III** - The papillary hypertrophy obscures the follicular response 
- **Stage IV** - Conjunctival scarring develops with continued follicular hypertrophy 

**Treatment of Trachoma**

- All cases of trachoma, mild to severe, should be treated with oral tetracycline (or erythromycin) 250 mg for 3 to 6 weeks.
- Topical treatment (tetracycline, erythromycin or sulfonamides) for 2 to 3 months can achieve some success, but are not the treatment of choice.
- The family members and intimate associates should also be treated with topical antibiotics b.i.d for 1 to 2 months.
- In cases with active corneal involvement, topical steroids may be indicated. However, the prognosis for response is guarded.
- If there are any suggestive verrucous signs or symptoms present, refer to a medical evaluation.
Tailor care for Trachoma

- Follow the patient every 2 to 3 weeks in the beginning, and then as needed.
- An active disease usually takes about 5 to 6 months to run its course (with or without treatment).
- Most cases result in some degree of conjunctival and corneal scarring, and the patient should be informed about the prognosis.
- Careful instructions should be given to patients under care and, also, once at a high risk (exposed, endemic, or ethnic populations) of acquiring trachoma. These instructions should include hygiene and the monitoring for early signs.
Critical Signs for Traumatic Iritis

- Generally, there is a history of trauma.
- Contusion injury to the iris stroma results in cells and flare in the anterior chamber.

Symptoms of Traumatic Iritis

- Pain
- Photophobia
- Tearing
- History of ocular trauma within the last few days

Work-Up for Traumatic Iritis

- Complete case history. Get the nature of the accident.
- Visual acuity
- Complete ophthalmic examination including IOP measurement and dilated fundus examination.
- Consider gonioscopy and 120 pt. screening field.

Follow-Up for Traumatic Iritis

- If there is no improvement in 3-7 days, systemic therapy should be started (prednisolone 1.0% qid) in addition to cycloplegic therapy.
- If condition is resolved, cycloplegic agent is discontinued.
- In one month:
  1. Check the anterior chamber angle with gonioscopy looking for angle recession which predisposes the eye to glaucoma.
  2. Check.are areas with scleral depression and B/D for retinal breaks or detachments.

Treatment of Corneal Foreign Bodies

- Cycloplegic (cyclopentolate 1.0-2.0% qid or homatropine 5%) - Some practitioners also treat with steroid initially:
  - 1 drop of prednisolone 0.125% 1.0% qid
- Recheck in 1-2 days to one week depending upon the severity of injury. Spontaneous recovery is the rule.
**Etiology of Trichiasis**
- Sporophores: Congenital versus acquired
- Chronic blepharitis: Thickened, erythematous, inflamed eyelid margins with oozing serosanguineous and pilosebaceous blood vessels running across them
- Entropion: Inward turning of the eyelid margin may be due to Steven-Johnson syndrome, ocular pachytrichia, chemical burns, trachoma, or others
- Mesodermal presentation

**Symptoms of Trichiasis**
- Orbital irritation
- Foreign body sensation
- Frequent hyperemia and epiphora
- Red eye

**Signs of Trichiasis**
- Inferior lid involvement more often than superior
- Misdirected eyelashes or lashes
- Inferior vertical or regular foreign body tracking
- Superficial punctate keratitis
- Conjunctival injection
- Corneal abrasion

**Critical Signs for Trichiasis**
- Fine filamentary lashes or complete lash(es) turned inward rubbing against the inferior corneal surface

**Treatment of Trichiasis**
1. Remove the misdirected lashes.
   a. A few misdirected lashes can be removed at the slit lamp with fine forceps (reassurance is important; 3-4 weeks in youth and 4-6 weeks in adults).
   b. Diffuse, severe or recurrent trichiasis, the misdirected lashes can sometimes be removed as above, however, definitive therapy generally requires alleviation, cryotherapy, or surgery.
2. Treat the DPK with topical treatment (e.g., erythromycin or bacitracin 5%) for several days.
3. Treat any active or chronic marginal lid disorders.

**Follow Up for Trichiasis**
- The patient can usually self-manage the condition with proper instruction.
- The patient should return if corneal irritation occurs.
**Etiology of Vernal Conjunctivitis**
Vernal conjunctivitis is a seasonally recurrent, bilateral inflammation of the conjunctiva usually presenting in warmer weather. It may occur in one of two forms:

- A palpebral form which is distinguished by cobblestone papillae on the upper tarsus which may be associated with subtle edema of the upper tarsus.
- A limbal form which occurs with papillary hypertrophy on the limbal conjunctiva associated with white, edematous lesions known as Trantas' dots near the limbus. Limbal vernal is more prevalent in black patients.

There is usually a family or personal history of allergies, with young males between the ages of 12 and 30 being at the highest risk.

**Symptoms of Vernal Conjunctivitis**
- Intense itching
- Watery discharge
- Photophobia
- Foreign body sensation
- Burning
- Mucus discharge
- Blurred vision

**Critical Signs of Vernal Conjunctivitis**
- Large conjunctival papillae, commonly referred to as "cobblestone papillae" under the upper eyelid. Eversion of the upper eyelid is necessary to make the diagnosis.
- Thick,ropy,whitish-yellow strands of dense mucous may cover the superior tarsus and conjunctiva, spread onto the cornea, and accumulate at the inner canthus.

**Differential Diagnosis of Vernal Conjunctivitis**
- Atopic keratoconjunctivitis - year round allergy
- EK (superior limbal keratoconjunctivitis) - usually a milder, less symptomatic presentation
- GPC - also less symptomatic and more related to a cause (e.g., contact lenses)

**Treatment of Vernal Conjunctivitis**
- All forms of vernal conjunctivitis respond dramatically to steroids. The recommended concentration and dosage is 1% prednisolone (or equivalent) q2-4h for 3-7 days. The duration may have to be prolonged in more severe cases.
  - Taper the steroids to the lowest maintenance dose (e.g., 1 g/3-4 per week) and continue this maintenance dose for 6-8 weeks.
  - With the long term use, steroids can lead to the development of cataracts or an elevation of the intraocular pressure. These must both be monitored if topical steroids are used.
- Topical antibiotics (e.g., erythromycin or sulfacetamide drops qid).
- A bandage hydrophilic lens is recommended for prophylaxis.
- Cycloplegic agent (e.g., homatropine 3% qid).
- Cautious sodium hypochlorite 1% qid may be introduced during the tapering of the steroid but it is not effective as initial therapy.
- Cool compresses qid.

**Follow Up for Vernal Conjunctivitis**
- Milder forms of vernal conjunctivitis usually respond very quickly and completely to steroids in 1 week and may or may not need maintenance regimes.
- Limbal vernal does not require maintenance regimes with steroid usage.
- Patients with more severe forms should be carefully advised of the chronic nature of their disease with remissions and exacerbations over an extended period of years (generally 5-10).
- Advise patients in advance to report symptoms upon exacerbation or to be rechecked on an annual basis.
**Viral Conjunctivitis**

**Main Menu**
- Ethology
- Symptoms
- Signs
- Critical Signs
- Differential Diagnosis
- Treatment
- Follow Up

**Symptoms of Viral Conjunctivitis**
- Tearing and irritation of one eye with frequent unilateral mucinocclusion reported
- Watery discharge
- Photophobia
- A history of cold is typically 3-7 days
- There may be a prodromal medical history, especially in children, e.g. upper respiratory infection (URI), minor cold (not influenza), a few days fever, or even commonly - pharyngocconjunctival fever (PCV)
- Occasionally, there is a previous history of conjunctivitis
- A mild discharge in visual acuity (transient)

**Etiology**

**Signs of Viral Conjunctivitis**
- Red edematous eyelids with a puffy-pinkish bullous hyperemia.
- The infection usually begins at the inner canthus and spreads laterally to involve the entire conjunctiva (vessels may blanch with a vanuscentricity).
- Membrane/pseudomembrane formation in the inferior cul-de-sac.
- The most common discharge is that of a serum (none, watery) variation.
- Follicular changes - pale rounded infiltrative cellular accumulation on the palpebral conjunctiva of varying diameter.
- Follicular changes in the lower cul-de-sac of children are considered to be normal.
- Follicular changes on the superior tarsal plane (in children or adults) is usually not considered to be normal.
- Chemosis
- Subconjunctival hemorrhages
- Occasional preauricular lymphadenopathy (tenderons on palpation).
- Subepithelial corneal infiltrates may develop several weeks after the initial onset.
- Sore eye involves which may persist for months to years following the infection.
- There is typically a quick NaF tear break-up time which can ultimately produce secondary corneal drying (dry eye) which may lead to more significant changes.

**Follow Up**
- If a bacterium is isolated, appropriate therapy should be started.
- In any case, the infection should be treated with a topical antibiotic for at least 7 days.
- Careful follow-up usually rules out the possibility of bacterial conjunctivitis.
- The patient should be instructed to avoid touching the affected eye until the infection is under control.
- The patient should be advised to wash their hands frequently and avoid sharing items that come into contact with their eyes.
- The infected eye should be treated with artificial tears, which may help to alleviate the symptoms.
- The patient should avoid wearing contact lenses until the infection is completely resolved.
- The patient should be instructed to return for a follow-up appointment to ensure that the infection has been cured.

**Differential Diagnosis for Viral Conjunctivitis**
- There are four specific etiologies that need to be ruled out when considering viral conjunctivitis as a potential diagnosis.

**Critical Signs of Viral Conjunctivitis**
- A follicular response of the superior tarsal conjunctiva.

**Treatment for Viral Conjunctivitis**
- There is no prescription cure for viruses of any kind.
- Antiviral agents are not effective for adenovirus.
- Prophylactic antibacterial use is questionable as to the value and efficiency.
- Steroid and avoid corticosteroid drugs should be limited to the more severe presentations.

**Options**
1. Ocular lubricants (moisturizers) to supplement and protect the tear film from desiccation.
2. Topical antiviral agents (acyclovir) preparations (e.g., Neovir A) will improve the appearance and may reduce the symptoms.
3. Warm/cool compresses several times / day for 1-2 weeks.
Conclusion

This software is designed to aid both the student and clinician in the differential diagnosis of a red eye. There are four main sections to the program:

- **Main Menu**
- A list of all conditions covered in the program which are separated by tissue involved. This can serve as a menu providing rapid transference from one disease to another.
- **Differential Diagnosis**: By entering signs and symptoms, the computer will come up with a "List of Possibilities" for the etiology of the red eye.
- **45 "Disease Stacks"**: These stacks contain information about each condition including a treatment and follow-up regimen.

Since ocular conditions do not always present with the same signs and symptoms, we have programmed each condition with the "TYPICAL" signs and symptoms. As students, we have limited clinical experience and have relied heavily on textbooks and our two advisors for the information contained in this program.

We have tried to be as specific as possible in describing the management of those conditions that are commonly treated by optometrists in states with therapeutic laws. Or treatment regimens are general for those conditions that are best treated by other health care professionals. Keep in mind that most therapeutic modalities described here are not the only ways to treat that particular condition but are ones that were commonly given in the references we used. Therefore, they are guidelines and not absolutes. It is beyond the scope of this program to list all of the contraindications and side effects of the drugs listed here. Please consult the Physicians Desk Reference if questions exist and to keep abreast of revised recommendations.
We realize that with a project of this magnitude and our limited clinical experience, errors and omissions may exist. Again we have strived to be as complete and concise as possible, but we recommend that you use this only as a guide and not as the sole source in treating conditions, especially those that you are not familiar with treating. Therefore, we do not imply or accept professional liability for the treatment of those conditions included in this software.

Although every possible cause for a red eye has not been included, we hope that this program is helpful to all that use it, and we welcome any suggestions or corrections so that we can include them in the next version.

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