COMMON ANTERIOR SEGMENT CONDITIONS

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Optometrists today are expected to practice beyond the old perception of only glasses and contact lenses. The definition of a doctor of optometry, supplied by the American Optometric Association, covers the duties, capabilities and responsibilities of a modern optometrist. "Doctors of optometry are independent primary health care providers who examine, diagnose, treat and manage diseases and disorders of the visual system, the eye, and associated structures as well as diagnose related systemic conditions."

Some optometrists practice every aspect of this definition everyday in their own practice setting. These individuals feel they received the training to not only perform refraction and fit contact lenses, but also "diagnose and manage diseases of the eye". These optometrists have the confidence and knowledge to treat as far as their law allows, including corneal ulcers, glaucoma, and using oral medications.

Some optometrists choose to limit their practice to visual testing for glasses and contact lenses. These optometrists generally refer a patient for further care if disease is detected. This is not uncommon, according to a 1993 Review of Optometry survey.

	Manage	Co-manage		Manage	Co-Manage
CORNEAL ULCERS	17%	24%	BLEPHARITIS	66%	18%
IRITIS	25%	20%	GPC	71%	11%
EPISCLERITIS	39%	16%			
FOREIGN BODY	48%	16%			
CORNEAL ABRASION	58%	18%			

This survey demonstrated the low number of optometrists that manage these conditions themselves or even co-manage with an ophthalmologist. Obviously, most patients with these conditions are referred for further care.

This paper is written to guide the reader through the signs, symptoms, and management of common ocular health problems that optometrists face in the real world. The topics covered are within the capabilities of any optometrists that want to treat more common conditions. The rare ocular disease and even the rare causes of more common ocular diseases are not included in this guide. There is also a section on an important diagnostic tool that most optometrists do not take advantage of---laboratory smears and cultures.

CORNEAL ULCERS

Infectious keratitis may not be the most common disease an optometrist may encounter, but it might be the most threatening to vision. Minimal clinical experience and the seriousness of the condition may deter some optometrists from treating their corneal ulcer patients. Only 17% of corneal ulcer patients are treated by optometrists alone.[1] And optometrists only co-manage 24% of their corneal ulcer patients with ophthalmologists.[1] Obviously, most corneal ulcer patients are referred for treatment. The management of infectious keratitis is not easy, but it is definitely within the scope of optometry. The most effective treatment for corneal ulcers is topical antibiotics. Almost every optometrist in the United States can use these medications through his or her state law.

The most common infectious etiology is bacterial and corneal infections are assumed so until proven otherwise by lab tests. Fungal infections must be considered after a traumatic corneal injury, especially from vegetable matter, such as a tree branch. Fungal infections may also occur in non-traumatized, but previously diseased eyes. Acanthamoeba infections usually occur in soft contact lens wearers who practice poor lens hygiene or have a history of swimming in their lenses. This patient often complains of extreme pain. Atypical bacteria usually follow penetrating injuries or corneal grafts.

Bacterial Keratitis

Presentation

Bacterial infections present with mild to severe pain, photophobia, and blurred vision. As you know, this condition represents an ocular emergency. The cornea may present with a round or oval, yellow-white densely opaque stroma. If the cornea presents only with the focal white stromal opacity, it is called an infiltrate. An ulcer exists if there is an overlying epithelial defect that stains with fluorescein. Thick and mucopurulent exudate may present with certain bacteria, such as *Pseudomonas*. An anterior chamber reaction or even a hypopyon is often present. The surrounding conjunctiva may be injected and the upper eyelid edematous.

Differential Diagnosis

When a patient with an early infectious keratitis comes to your office, the eye may not look much different than a non-infectious injury. It may appear injected and inflamed, but an early-stage infection may look like a sterile infiltrate. It is very important to determine the difference. In the event of equivocal findings, you're better off treating the problem as an infection until cultures prove otherwise. Several factors can help you distinguish an infection from a sterile involvement.

Patient History: An infective ulcer usually brings greater pain than a sterile infiltrate. The symptoms from ulcers tend to have a more rapid and severe onset. The patients have more pain and more photophobia. The contact lens wearer may have non-infectious corneal infiltrates from an immune reaction to the lenses or solutions. A patient with a history of blepharitis may have staphylococcal hypersensitivity infiltrates.

Location: As a general rule, infective ulcers are usually located entrally or paracentrally, while sterile infiltrates are typically found closer to the limbus.

. Density: An examiner using a slit beam typically cannot see through an infectious infiltrate to the iris detail. A sterile infiltrate generally will not be as dense and if you focus the slit lamp accordingly, you can make out nice iris detail.

Anterior Chamber Reaction: An infectious infiltrate or ulcer almost always has an anterior chamber reaction. The reaction also generally will be more intense. The sterile infiltrate may or may not have a mild cell and flare response. The sterile ulcer and staph hypersensitivity infiltrates will have a minimal anterior chamber reaction at best.

Fluorescein Staining: There are differences of opinion whether staining signifies an infectious ulcer. Many clinicians feel that if the affected site doesn't stain with fluorescein, there is no epithelial defect, therefore you can rule out an infectious ulcer.[2] They feel that since there is no infection, there is no need to scrape and culture. The Wills Eye Manual states non-staining infiltrates are the same as ulcers if the infiltrates are thought to be infectious.[3] The manual instructs that both should be treated the same. Positive fluorescein staining also may or may not indicate an infection. A sterile ulcer will also stain because it is an ulcer. It cultures negative because there is no infection.

Sterile ulcers may be caused by dry eye syndromes, neurotrophic keratopathy, or vernal keratoconjunctivitis to name a few.

Size: The size o the inflammation under the epithelial break relative to the break is important. If the cloudy area or infiltrate is bigger than the epithelial break, then it is probably a non-infectious infiltrate. The general rule for ulcers is that the underlying stromal inflammation is approximately the size of the break. Any break may have to be treated as an infectious process though, since the epithelial integrity has been compromised.

Pre-Treatment Work-up

The clinical assessment should be directed towards factors in the history and the physical signs, which may indicate the cause, and identify the organism. You must play the odds during this assessment to find the most probable cause of the infectious keratitis. Trauma is the major cause of infectious keratitis, and contact lens induced trauma causes a third of all cases.[4] These are good areas to start the questions with. Some good examples of questions: Is the patient a contact lens wearer? If so, what lens-care regimen? Has the patient experienced an ocular trauma or corneal foreign body? Has the patient had prior eye care to this office visit? If so, did the patient use antibiotics or topical steroids? Has the patient had previous corneal diseases? Does the patient presently have a systemic illness?

The next step will be visual acuity testing. The slit-lamp examination is next. The cornea should be stained to determine if there is an epithelial loss over the infiltrate. Document the size, depth, and location of the corneal infiltrate. Also perform an assessment of the anterior chamber for a possible reaction. Also do not forget to measure the intraocular pressure

The next step is also very important. Corneal scrapings must be done for smears and cultures as described in the lab studies section. All ulcers must be evaluated by lab tests if there is any chance of an infectious nature. There is a difference of opinion whether non-staining infiltrates should be scraped.[3,5] The general opinion is to scrape and test non-staining infiltrates that are considered to be infectious.

Treatment

Once you have proceeded through all of the preliminary work-up, you now must treat the condition. As mentioned earlier, intense topical treatment is the most effective route for corneal infections. Do not wait to get the lab results back before starting this treatment of topical antibiotics and cycloplegics.

Fluoroquinolones, such as ciprofloxacin 0.3%, ofloxicin 0.3%, and norfloxacin 0.3% are the drugs of choice for treating infectious keratitis.[4] Ciprofloxacin is even FDA approved specifically for this treatment.[4] As with any infectious process, aggressiveness of therapy should match the severity of the clinical disease. If the ulcer is penetrating and in the visual axis, consider the recommended dosage of a fluoroquinolone: two drops every 15 minutes for the first 6 hours, then two drops every 30 minutes for the next 18 hours. A deep and large ulcer off the axis should follow the same therapy. A smaller off-axis ulcer or non-staining infiltrate with minimal anterior chamber reaction may only require tobramycin or ciproflxacin drops every 2-6 hours. Tobramycin ointment also can be added at bedtime(q hs). Patients with corneal ulcers usually have uveitis and are very uncomfortable. You should cycloplege to reduce photophobia, pain and the risk of synechiae. Scopolamine 0.25% tid or homatropine 5% qid work well. Once control of the ulcer is achieved, the fluoroquinolone dose frequency can be tapered back to the qid level for several more days as needed. Oral pain medications, such as acetaminophen may also be needed for patient comfort. Remember, a patch is never placed over and eye thought to have an infection.

Traditional antibiotic therapy included a fortified aminoglycoside--such as gentamycin or tobramycin to eradicate gram-negative organisms and a fortified cephalosporin--usually cefazolin--aimed at gram-positive organisms. Studies on gram negative bacterial keratitis in rabbits showed that ciprofloxacin performed significantly better than the aminoglycosides.[6] The aminoglycosides are also highly toxic to the eye and have caused a high incidence of iatrogenic disease.[4] Gentamycin also has an increasing prevalence of resistance by *Pseudomonas* strains.[4]

A new broad-spectrum combination strategy teams ciprofloxacin (Ciloxin) with polymyxin/trimethoprim (Polytrim).[7] Ciloxin is highly effective against all ocular

pathogens except possibly *Pneumococcus*, while Polytrm is in fact potent against this organism. This combination battles resistant *Psuedomonas* more effectively than fortified antibiotics, with less toxicity.[7]

Follow-ups must be daily with repeated measurements of the size of the infiltrate and/or ulcer. The first 24 hours of treatment should show little or no increase in the size of the epithelial defect or size and depth of the infiltrate. Other very important criteria for evaluating the response to the treatment include patient comfort (degree of eye pain) and the anterior chamber reaction. Less pain, a smaller epithelial defect and infiltrate, and a less-inflamed eye are all favorable responses. As the ulcer decreases in size and depth, taper the hourly schedule to a decreasing frequency. If the treatment plan is not working, the antibiotic regimen is adjusted according to the culture and sensitivity results.

As the ulcer begins to resolve, consider adding a hypertonic agent to reduce corneal edema. A topical steroid may be necessary if the anterior chamber reaction is not improving. Do this **only** after the ulcer noticeably improves. The patient should continue using the antibiotic drops for at least a week after the ulcer has completely re-epithelialized.

Corneal Ulcers References

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LAB WORK FOR THE OPTOMETRIST

As more and more optometrists are taking advantage of their state TPA laws and treating ocular infections, lab work will become a more integral part of ocular care. Laboratory evaluation can be a good source of information for optometrists and can at least rule out certain organisms. Many acute or chronic red eyes would benefit from lab tests. Also many ocular infections, like corneal ulcers, **require** lab work or that optometrist is not fully treating the patient.

Lab procedures are helpful in the treatment of ocular disease by optometrists because they are helpful in establishing or confirming a diagnosis of an anterior segment infection. Although the optometrist may have started the patient on a broad-spectrum antibiotic, he will have no recourse if the condition gets worse and he did not have lab tests done.

The ocular lab tests that are important are called smears and cultures. Smears are procedures whereby a sampling of infected tissue is fixed on a glass slide, treated with varying stains, and inspected under the microscope.[1] The term smear is a synonym to staining, and ocular cytology. Cultures involve inoculating an agar plate with a specimen. Both staining and cultures should be run when it is determined that lab work will help with the diagnosis, and ultimately the treatment. One is not better than the other and generally each just gives its own pieces to the disease management puzzle. Both are done for the purpose of a more accurate result. Literature confuses readers by stating that a "culture" or a "stain" should be done for an ocular disease when in reality, both are usually run.

When You Should Use Cultures/Stains

The basic premise for the treatment of the ocular disease by optometrists is that if you suspect that there is and infectious process, you should culture it.[2] It is also necessary to culture if previous treatment has not cleared up the condition. A change from a broad-spectrum antibiotic to a more specific one is a good example. Cultures should also be done for hyperacute conjunctvitis and when symptoms and complaints do not correspond

with exam findings. It is also a good idea to culture for chronic diseases that have resisted treatment.

More specifically, it is mandatory to culture:[2]

*All neonatal conjunctivitis
*Hyperacute conjunctivitis
*Orbital cellulitis
*Corneal ulcer
*Hypopyon keratitis
*Endophthalmitis
*Penetrating trauma

Recommended to culture:[2]

*Chronic conjunctivitis
*Membranous conjunctivitis
*Keratitis without hypopyon
*Chronic blepharitis
*Immunocompromised patients
*Nosocomial infections
*Ulcerative conjunctivitis
*Public health conditions

Rarely helpful to culture:[2]

*Dendritic corneal ulcer
*Acute blepharitis
*Papillary conjunctivitis
*Hordeolum
*Corneal abrasion

How To Culture

A culture involves introducing a specimen to an agar plate. The specimen is collected from the eye by either scraping or swabbing. These two terms are not interchangeable. The swabbing technique involves a cotton tipped sterile swab or curette. Scraping involves using a platinum spatula to obtain the specimen.

<u>Scraping</u>

The scraping technique is used for culturing purposes when there is a corneal ulcer. It is important you follow proper laboratory procedures. Since you are dealing with a very small volume of material and transport medium tends to dilute the sample, it is better to plate directly onto a solid agar surface.[3] Failure to plate directly often leads to negative results.[1]

Step by step culturing with a scraped specimen

Step 1: The first step in taking a culture is to anesthetize the cornea. Conventional proparacaine or benoxinate will work well.

Step 2: The second step is to use a Kimura platinum spatula for scraping the infected site. It is the instrument of choice for scraping the ulcer.[3] Hold the tip of the spatula in the of an alcohol lamp for several seconds, then allow it to cool for at least five seconds.

Step 3: The third step is to gently remove any debris or necrotic tissue with the edge of the spatula. Then scrape the base of the ulcer. That is the area where most of the specimen will be obtained.

Step 4: The fourth step is to transfer the material to the surface of the blood and/or chocolate agar in a small "C" shaped pattern.

Step 5: The fifth step is to repeat the fourth step, creating another small "C" pattern. Try to open the lid only far enough to admit the kimura spatula. Avoid breathing directly onto the plate. The plate should not be exposed to any more contamination then is absolutely necessary.

Step 6: The sixth step is to take all plates to the lab as soon as possible. Do not forget to label each plate with a china marker or tape. The label should include the patient's name, date, and source of the inoculum. (i.e. Walt Betts, 8 July 95 OS cornea)

Swabbing

The swabbing technique is used for conjunctival or periorbital specimen collection. The swab is run over the area that is most affected by the bacterial contamination. For example, in infections of the tear ducts, purulent material should be collected on or over the lacrimal sac. Sampling of the conjunctiva is a frequently used procedure. The lower palpebral conjunctiva cul de sacs are gently swabbed and the specimen is used to inoculate the agar plate. Specimen collected for swabbing must precede the anesthesia required for scraping since the anesthesia may interfere with the microbes.[4] The inoculation process of the agar plate for swabbing is the same as for scraping (Step 4 to Step 6).

Agar Media

Blood agar works well for *Staph. aureus, Streptococcus, Moraxella*, and *Pseudomonas.* Chocolate agar works for all these, as well as *Neisseria* and *Haemophilus*. Thayer-Martin agar is specific for *Staph. aureus*. Sabourauds agar plates should be used if you suspect a fungal infection. For most ocular diseases, blood and chocolate agar are all that is required. Both types are recommended by labs for the same specimen because it gives the specimen a better chance of desired growth and more accurate results.[5]

Smears/Stains

A smear is a term that describes the process of smearing the specimen on a glass slide for the purpose of staining. The specimen is usually collected by the previously described swabbing technique, although corneal smears by scraping can also be done. The more common swabbing technique involves a cotton tipped sterile swab or curette. Swabbing and staining are commonly used for conjunctivitis and periorbital infections. The specimen is treated with varying stains and viewed under the microscope. Differential staining allows identification of mainly epithelial cells, inflammatory cells, and cellular elements, such as inclusions and microorganisms.[1] The most commonly utilized stains are the Gram, Giesma, Wright, and Diff-Qik stains.[1] The stain specific for bacteria is the gram stain, from which gram positive vs. gram negative can be determined. The Giesma, Wright and Diff-Qik stains are used to identify some of the epithelial or blood cells found on slide preparations.[6]

Lab Applications for the Real World Optometrist

The minimum a modern optometrist that treats ocular disease should use a lab for is the evaluation of swabs done at the office. The optometrist would swab the infected area, whether it be conjunctival, corneal, or periorbital and send the swabs in their own collection kits. The "culturette" kits by Becton Dickinson Microbiology Systems can be ordered from your local labs. The lab would evaluate the swabs by applying he specimen to a glass slide for stains and inoculate the agar plates for cultures. This method may be sufficient for some cases, although the lab results may be less accurate due to this lengthy process.

The better use of labs by optometrists is also commonly done by ophthalmologists. Dr. Winkle, an ophthalmologist at Madigan Army Medical Center in Tacoma, WA, said that the eye doctor would have agar plates and slides in office if he or she is located somewhat near a lab. He feels it is more accurate to inoculate the plates in office. He would immediately smear the slide with the specimen and/or inoculate the plates for culture. He also said their clinic usually inoculates four agar plates for each patient in the manner described earlier. Two of the plates would be chocolate and blood agar for bacteria and two would be fungal. The plates and slides would be taken to the lab as soon as possible. This method increases the chance for a truly accurate result.

Pearls

*It is not difficult to inoculate the agar plates in office. You need to follow the procedures already discussed. Remember, most of the time you will only need chocolate and blood agar plates.

*Also remember to use the Kimura spatula for the scrapings. It is the universal instrument of choice used to collect tissue from corneal ulcers for bacterial smears/cultures.

*Remember to keep the possible plate contamination to a minimum. Also do not cut the agar when inoculating it. Cultures cost $25-$30 a piece.[2]

*It is also not difficult to smear a slide. Remember to spread the material in an even distribution and then let air dry. Once the slides are dry, the lab can do all of the staining and interpretation for you. There is no need to stain the slides yourself. The accuracy with stains is gained by the immediate smear in office, not with the in-office staining.

*Remember to add the anesthesia for the scraping after the swabbing. The anesthesia may affect the results of the swabbing.

*Labs are not accustomed to working with the small colonies of bacteria cultured from eyes. They may disregard them as contaminates. It is important to instruct the lab in writing to report any and all growths.[3] Reiterate to the microbiologist that even the smallest colony may be very significant.

Lab Results

As you can probably guess, most lab smears and cultures come back without any definite results. The indigenous flora that exists in the eye may show up on the lab printout. *Staph epidermis* and *Lactobacillus* in the conjunctival sacs are the most frequently encountered organisms.[7] *Staph aureus* is found in 25% of healthy eyes, and *Haemophilus influenza* colonizes 0.4 to 25% of healthy eyes.[7] The lab printout may contain "coagulase negative", which means normal flora is present.

Conjunctivitis Results

Bacterial conjunctivitis is the most common infectious conjunctivitis.[8] In adults, the most common organisms cultured are *Strep. pneumonia*, *Staph. aureus*, and *Staph. epidermidis.* However, there can be a dispute as to the significance of isolates of the latter two organisms, since they are also often recovered from non-infected eyes. In children, the most common causes of bacterial conjunctivitis are *Haemophilus influenzae*, *Strep. pneumoniae* and perhaps *Staph. aureus.*[9]

Keratitis Results

Bacteria account for 65% to 90% of corneal infections. In the United States, the most common infecting organisms are *Staph. aureus, Strep pneumoniae, Psuedomonas aeruginosa*, and *Moraxella.* The first three organisms listed account for more than 80% of all bacterial corneal ulcers.[7]

Viruses

Lab tests for viruses are lab specific. The eye doctor would call the lab he plans to work with and the lab would direct him from there. The smear and stain is possible and can be helpful in narrowing down the list of agents, but the highly specific ELISA gives a much greater reliability. Virus cultures are possible too, but the specimen transportation is more involved with required temperatures near freezing. Viruses are the cause of 20% of all conjunctivitis infections, therefore it might be worth asking the lab about.[7]

Chlamydia

This intracellular organism gets diagnosed by exclusion. Thus, lab microbiology is very important with chlamydia patients. The swab used for testing is from a chlamydia specific transport system. You cannot use other swabs for the evaluation by the lab. A

common swab system used is the Pace 2 from Gen-Probe.[5] This is the system the microbiology lab uses at Bassett Army Community Hospital at Ft. Wainwright, AK. Another test to ask your lab about is called the Syva test.[10] It is 99% accurate and you should get the results back in three to five days. Either way, the specimen is collected by a conjunctival swab of the lower palpebral conjunctiva, followed by the upper palpebral conjunctiva. Swab the least affected eye first. Immediately place the swab in the specific transport tube. Break the plastic-only swab shaft at the line to fit the tube and cap the tube tightly.

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ANTERIOR UVEITIS

Uveitis is a general term for the inflammation of the uveal tract--the iris, ciliary body, and choroid. This highly vascularized tunic nourishes the globe, yet can be affected by a number of disease processes. When inflamed, the entire uveal tract can act as a lymph node to combat infection through the proliferation of lymphocytes, plasma cells and antibodies.[1] Anterior uveitis is an intraocular inflammation of the uveal structures anterior to the middle of the vitreous cavity.[2] Anterior uveitis occurs in 8-12 of every 100,000 people in the United States per year.[3] Anterior uveitis is four times more common than posterior involvement and is more benign.[2] The incidence of uveitis is highest between the ages of 20-50 years with a peak incidence found the third decade of life.[4] Close to 40% of anterior uveitis cases recur.[2] Iritis refers to an inflammation of the iris only, while iridocyclitis involves both the iris and ciliary body. However, the terms anterior uveitis, iritis and iridocyclitis are often used synonymously.

Common Signs and Symptoms

Optometrists, through their broad geographic distribution, are often the first health care practitioners to diagnose anterior uveitis. A skilled, yet inexperienced optometrist can readily spot the signs and symptoms of anterior uveitis. Pain, photophobia, and an anterior chamber reaction constitute the diagnostic triad for acute iritis. Also common signs to look for are circumlimbal flush, conjunctival injection, lacrimation, and a miotic pupil. More severe presentations may be characterized by a hypopyon, keratic precipitates (KPs), iris nodules and synechiae. The cells and flare in the anterior chamber is probably the most diagnostic clue of an anterior chamber reaction. The grading of the number of cells is very subjective. If any cells are seen, you know there is at least some kind of anterior reaction going in and that is your main concern. If you see 5-10 cells in one slit beam it is a grade 1, 10-20 cells-grade 2, 20-50 cells-grade 3, and over 50 cells is a grade 4. Flare is even more subjective because you grade the flare

by how well you can see it and through it. The terms to describe it are faint , moderate, and dense.

The two types of anterior uveitis classically used to describe are nongranulomatous and granulomatous anterior uveitis. Nongranulomatous is characterized by small, white (not mutton-fat) KPs without iris nodules. Nongranulomatous anterior uveitis is not associated with a pathogenic organism and is usually responsive to corticosteroids. It may occur from trauma, systemic syndromes, or corneal infections. In contrast, granulomatous anterior uveitis generally follows a microbial infection, such as TB or syphilis, and is associated with large mutton-fat KPs and iris nodules.[5]

Treatment

Obviously the type of anterior uveitis, nongranulomatous or granulomatous and severity of either determines the management direction. Either way, the treatment goals are the same . The goals are to prevent synechiae, preserve visual acuities, curb the frequency, and severity of attacks by identifying the source of inflammation if possible, guard against uveitic glaucoma and/or cataracts and relieve ocular pain.

The treatment of anterior uveitis is non-specific, ranging from cycloplegics alone to aggressive use of cycloplegics with topical or even oral steroids. A trace anterior chamber reaction can be treated with cycloplegics alone. The mild to moderate anterior chamber reaction requires topical steroids added to the cycloplegics. A severe anterior chamber reaction may require oral or subconjunctival steroids and more potent cycloplegics.

The cycloplegics are used to prevent synechiae and reduces the ciliary spasm that triggers uveitic pain. Additionally, cycloplegics help to reduce tissue and/or vessel permeability. Cyclopentolate 1% may be used three times per day (tid) for a trace to mild anterior uveitis. Homatropine 5% may be used twice daily (bid) or tid for moderate anterior uveitis. Severe anterior uveitis requires aggressive cycloplegia. Homatropine is a good choice every four hours (q4h). Scopolamine 0.25% bid may be more helpful with darkly pigmented and black patients. Occasionally there is a need to use Atropine 1% for severe cases of anterior uveitis and posterior synechiae. The clinician has to be very careful with the more potent atropine and scopolamine since both widely dilate and immobilize

the pupil inviting formation of posterior synechiae in the dilated position. Even still, breakage of severe posterior synechiae may require Atropine 1% and Neosynephrine 10% q4h.[6] Remember to consider using the Scopolamine or Atropine only in cases of intense inflammation, when the patient has compliance problems, or in children who have trouble administering drops.

The corticosteroids are needed to smother the inflammation as quickly and completely as possible. Use the strongest, most effective topical steroid in frequent instillations and begin the slow tapering process as quickly as possible. The best regimen for this purpose is pred acetate 1% one drop every 1-2 hours for the first 24-48 hours, then tapered once the eye starts to quiet.

Clinical Pearls for Treatment

--Treat aggressively and taper slowly: Many practitioners are hesitant to use topical steroids more than four times a day due to possible steroid induced elevation of intraocular pressure. Fortunately, this condition is fairly rare.[6] A patient with moderate anterior uveitis should be treated with topical steroid drops at least q2h. In more severe cases, drops qh or q1/2h are appropriate. Cycloplegics should be used aggressively to prevent posterior synechiae. Topical steroids should be tapered slowly, but only after noting a significant improvement in the anterior chamber reaction.

--Do not forget about the sleeping hours: Often clinicians treat anterior uveitis aggressively during the day, only to have them go for seven or eight hours at night without treatment. Rather than wake the patient up every hour or two, try prescribing steroid ointment, such as Decadron, to be instilled at bedtime.

--Consider temporary punctal occlusion to increase compliance: This will decrease the tasting of the medications in the throat throughout the day. The plugs will also prevent drainage of much of the topical medications, increasing absorption.

--Consider bloodwork and medical co-management: If the patient has a severe episode or if the episode is bilateral or recurrent, an order of a screening of blood tests is a good idea. Some examples: complete blood count (CBC)-leukemia, viral infections, etc.

erythrocyte sedimentation rate (ESR)-arthritis syndromes, etc.

angiotensin converting enzyme (ACE)-sarcoid, etc.

Real World Example

A patient with anterior uveitis walks in your door with a mild to moderate nongranulomatous anterior chamber reaction. The patient knows something is wrong with the eye, but he is not sure what it is. The patient complains of one eye that is slightly blurry, uncomfortable, sensitive to the light, red, and teary. What would you do? You should perform a complete evaluation, including a thorough history. If anterior uveitis is your diagnosis, you may think about using homatropine 5% with pred acetate 1%(Pred Forte). The homatropine 5% generally will be prescribed for this patient bid-qid. The Pred Forte or equivalent varies in administering from q4h-qh. Pred forte is a suspension drug, therefore do not forget to tell the patient that he needs to shake the bottle thoroughly before every instillation. Also, over the counter ibuprofen, cold packs, and dark glasses may help for more patient comfort. Counsel the patient on the problem and RTC 48 hours. Begin to taper the steroid once the eye starts to quiet. A nice rule of thumb for minimum tapering is 1 gtt qid for 4 days, 1 gtt tid for three days, 1 gtt bid for two days, and 1 gtt qd for one day. Treatment must be tapered slowly to avoid rebound.

Corticosteroids

This class of drugs is very important to optometrists due to the fact that the epidemiology of eye disorders is largely one of inflammation. There are five different steroids that can be selected--prednisolone, fluorometholone, dexamethasone, medrysone, and hydrocortisone. The number of times each is prescribed is dependent on its potency and ability to penetrate into target tissues (i.e. cornea).

Potency differs substantially. Hydrocortisone is the least potent. Medrysone is 2.5 times more potent than hydrocortisone in equivalent doses, while prednisolone is five times more potent than hydrocortisone. Dexamethasone and the fluorometholones are very potent and therefore marketed in low concentrations.

The importance of potency depends on the ability of the steroid to penetrate the corneal layers. Penetration depends on whether the steroid is a suspension or a solution. The suspensions are acetate or alcohol derivatives. They generally penetrate very well since they are lipid soluble. The patient must shake the bottle thoroughly before each

instillation. The solutions are phosphate derivatives that are highly soluble in water. For this reason, they are most useful when treating ocular surface inflammations or when the corneal epithelium is not intact. The right combination of both makes a steroid very valuable in an optometric practice.

Prednisolone

This drug is the most clinically effective of the ophthalmic corticosteroids and, therefore enjoys the most wide-spread use. Prednisolone is the drug of choice for anterior uveitis and cases that involve monotherapy (i.e. pure corticosteroid). Studies show that prednisolone acetate is the most effective of the ophthalmic steroids for the treatment of corneal inflammations.[7] Prednisolone eye drops are available in 1% or 1/8% concentrations, of which 1% is much more clinically useful. Pred is available in acetate or phosphate forms. The most common form of prednisolone acetate is Allergan's Pred Forte, and the most common form of sodium phosphate is Ciba's Inflamase Forte.

The Fluorometholones

This class of drugs also enjoys wide-spread use in monotherapy and is the other corticosteroid that is used the vast majority of the time. This class works very well against inflammation and is the least likely of the steroids to increase the IOP. Fluoro-metholone alcohol is used very commonly to treat many mild to moderate ocular **surface** inflammatory conditions. The alcohol form is available in both 0.1% suspensions and ointment. The most common form is FML by Allergan. Fluorometholone acetate can be used for deeper inflammations than FML. This drug has been shown to be clinically equivalent to 1% prenisolone acetate, yet slower by approximately two to three weeks in affecting the IOP.[7] The most common forms are Flarex by Alcon and Eflone by Ciba.

Dexamethasone

This drug is very potent and is therfore only available in very low concentrations. It is not as clinically effective as prednisolone and has a greater propensity to raise the intraocular pressure, making it a drug of second choice. It is available in suspension, solution, or ointment. The ointment, Decadron, is very useful as a supplemental therapy in around-the-clock anterior uveitis treatment.

Medrysone

This drug is not used very often due to its poor penetration and weak anti-inflammatory ability. It is the most mild steroid available and is the least likely to raise the IOP. It can be used for mild surface conditions like allergic conjunctivitis.

Hydrocortisone

This drug is not available in ophthalmic solution nor ointment forms anymore. It is still widely used in dermatologic care. It is limited to periorbital dermatologic conditions

Rimexolone (new steroid)

This new drug is a potent, yet relatively safe preparation. It is similar in potency to prednisolone acetate, yet it has a decreased propensity to raise intraocular pressure. It also is recently FDA approved for post-operative inflammation control. This suspension is available as Vexol 1%.

Anterior Uveitis References

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COMMON BACTERIAL/VIRAL INFECTIONS AND TREATMENT

When a patient comes into the optometrist's office suffering from an infection, the eye doctor must know the signs and symptoms of the organism--usually bacterial or viral--that he will eventually have to manage. He must look for hints to the correct diagnosis. The previous section discussed the lab work that is very helpful with this process. This section aims for a few common infections that optometrists may face and manage.

Nonspecific Bacterial Infections (Conjunctivitis)

A patient walks into your office with significant irritation, redness and adnexal swelling. The bulbar conjunctiva may be grossly hyperemic and meaty red. The hyperemia may be greater toward the fornices with a relatively clear circumlimbal area. The patient also shows signs of the hallmark of a bacterial involvement--a thick, whitish-yellow or even green purulent or mucopurulent discharge. The patient reports that his lids stick together upon awakening.

Obviously any number of bacteria may to be blame for the infection. You may now decide to differentiate the etiology by ordering the lab analysis of the discharge. The swab preparation would be done as previously described for stains and cultures. In most cases, the patient is placed on a broad spectrum antibiotic that has a low toxicity and allergenicity. A good medication for this is tobramycin. Dosages vary with presentation, but qid for 7-10 days or until the lab results come back is perfectly acceptable.

Specific Bacterial Infection

The lab results are back for your bacterial conjunctivitis patient. If the results do not pin down an organism, do not panic. Staph organisms are the most common cause of bacterial conjunctivitis and are present 75% of the time on ocular surfaces.[1] The cultures and stains may be inconclusive due to the natural presence of the staph. If the patient is still suffering from the infection, but it is improving--the tobramycin may just need more time on the infection. There should be improvement in two or three days or suspect microbial resistance, inappropriate choice of drug, or incorrect diagnosis. This situation may indicate oral antibiotics, change to another antiinfective agent or extending tobramycin to 10-14 days.

The lab results may specifically point out a gram positive or gram negative organism. A gram positive organism, other than staph., may be strep. The tobramycin should work. Other options for staph. or strep. are fluoroquinolones, such as norfloxacin. A common gram negative organism for conjunctivitis is *Haemophilus*. The topicals containing polymyxin B or erythromycin or a fluoroquinolone should work well.

Antibacterials

Tobramycin--A good broad spectrum antibiotic to keep in mind for bacterial conjunctivitis. It is effective against gram negative bacteria, especially *Pseudomonas,* and is also effective against gram positive bacteria. It has a low toxicity and allergic reaction problem. It is most commonly known as Tobrex by Alcon. It is also available generically.

Gentamycin--This antibiotic is very comparable to tobramycin in every aspect, although it is slightly more toxic and slightly less effective against *Pseudomonas.*

Polysporin--This drug is a combination of bacitracin, for gram positive organisms, and polymyxin B, for gram negative organisms. This is an effective and widely used medication in ocular care. It has low resistance, toxicity, and allergic reactions. The only drawback is that Polysporin is available in an ointment only.

Neosporin--This drug is a combination of bacitracin, polymyxin B, and neomycin. Neomycin is a broad spectrum antibiotic. This is a very effective combination antibiotic and is available as a solution or ointment. The most important drawback is its toxicity. . About 8% of all users will experience a delayed, type IV hypersensitivity reaction to the neomycin.[2]

Polytrim--This drug is a combination of trimethoprim, for broad spectrum, and polymyxin B. This is a very good drug for adults, as well as children. This drug is highly prescribed for children because any reactions are rare. Polytrim may be safely prescribed to children as young as two months. It is excellent for treating bacterial conjunctivitis. It is available from Allergan as Polytrim in solution only. The recommended dosage is q3h while awake.

Bacitracin--A medication with a good activity against Gram + bacteria. Resistance, toxicity, and allergic reactions are rare. Bacitracin works well, along with lid hygiene, in the treatment of blepharitis. It is available in ointment form only.

Erythromycin--This ointment is effective against many Gram + and some Gram - organisms. It is a very gentle drug and commonly used prophylactically. It also works well whenever there is a corneal compromise as an antibacterial and lubrication. Erythromycin, thus works great for pressure patching of corneal abrasions. It also is used in delivery wards for neonatal prophylaxis against *Neisseria, Treponemia* and Chlamydia.

Sulfa Drugs--A broad spectrum, but ineffective class of drugs due to high resistance by staph. and *Pseudomonas* organisms. The ointment form may occasionally be used on children who do not like drops.

Fluoroquinolones--discussed with corneal ulcers

Nonspecific Viral Infection (Conjunctivitis)

This time a patient walks into your office with a red and swollen conjunctiva, mild punctate stippling and follicular conjunctivitis. The follicles are numerous and form "rugae"-like folds in the lower cul de sac.[1] Follicular changes on the superior tarsal plate are also present. This patient has an associated uveitis with small KPs, which is not uncommon for this condition. The conjunctivitis is presently unilateral, but it may spread to the fellow eye. There is an ipsilateral preauricular lymphadenopathy. The discharge is clear and watery with a seromucous or stringy appearance.

The discharge, follicular changes on the superior palpebral conjunctiva, and the lymphadenopathy are sure signs that this patient has a viral infection. Viral infections of the eye are not rare and the viral type is the most common form of acute conjunctivitis in children and adults.[1] Many times you may have to diagnose by exclusion. Use the signs and symptoms to rule out other causes of the red eyes. History is also key with viral infections. Occasionally, there is a recent medical history of a cold, sore throat or low grade fever.

Treatment

Most cases of viral conjunctivitis occur secondary to a systemic viral infection. The treatment for most viral conjunctivitis infections is primarily supportive because there is not a prescription cure for viruses of any kind. Antiviral agents are not effective against adenoviruses. A good supportive therapy is as follows:

1. Cool compresses and flushing the eyes with water--This provides symptomatic relief and washes away or dilutes viral toxins. Warm compresses also will enhance the body's immune mechanism by causing vasodilation. The patient should use both until symptoms decrease.
2. Decongestant or antihistamine--The decongestant/astringent, such as Zincfrin or Vasoclear A, may reduce the discharge and relieve symptoms. The antihistamine or vasoconstrictor, such as Naphcon-A, Opcon-A, or Vasocon-A, will improve appearance and may reduce symptoms and inflammation.
3. Antibacterials--A good rule of thumb is to use only if the eyes are crusted shut in the morning. If not, do not use at all due to the possibility of creating resistant strains of bacterial organisms.
4. Artificial tears and lubricants--These may help with comfort.
5. NSAIDS--If a patient with a viral or bacterial conjunctivitis is extremely uncomfortable, Voltaren or Acular may help reduce the inflammation. Unlike corticosteroids, these medications do not reduce the body's natural immune response.

Specific Viral Infections

Epidemic Keratoconjunctivitis (EKC)

EKC is caused by an adenovirus, such as 8, 19, 21, and others. EKC is a very common diagnosed virus to see in practice, with a 250:1 ratio versus Herpes Simplex.[3] EKC is also very contagious in the milder first stages (first 7 days). It is frequently associated with local outbreaks within the population. A study published in 1993 showed isolates from EKC patients still survived for up to 49 days from plastic surfaces and 28-49 days on metal surfaces.[4] It is commonly cultured form slit lamps applanation tonometers, and office drops.

The EKC clinical presentation is more hyperacute than other adenoviruses. The usual viral signs will be seen with EKC, including acute follicular conjunctivitis in the lower fornix of one eye greater than the other. EKC also exhibits a mild keratitis during the first 7 days of the disease course. Keratitis occurs in about 80% of cases.[5] The second stage, days 10-14, usually show subepithelial infiltrates. The eyes will appear very red and weepy. Stage three is characterized by anterior stromal infiltrates, which may persist for months or even years.[5]

Treatment

The treatment is supportive, as described earlier. Psuedomembranes may form with EKC and other acute viral infections. Remove by wet swabbing or with toothed forceps. FML or Flarex may help when the subepithelial infiltrates reduce vision or the keratitis is very uncomfortable. NSAIDS may also be used instead of the corticosteroids if desired.

Pharyngoconjunctival Fever (PCF)

PCF is generally associated with adenovirus 3. It is caused by an adenovirus with very comparable clinical presentations and treatment to EKC. PCF is generally milder than EKC with keratitis developing in 30% of the cases.[5] The treatment is also supportive therapy, although corticosteroids have no proven value.

PCF's triad of signs and symptoms are pharyngitis, follicular conjunctivitis, and fever. PCF is common in children. It is sometimes called the "swimming pool virus" because of its epidemic outbreaks in areas where children play together. It is very contagious for two weeks. The optometrist should take special precautions and warn the parents about the highly infectious nature of PCF.

Chlamydia

This disease does not really fit with the specific viruses section, but it should be discussed with the other organisms that cause conjunctivitis. You may want to check for this organism if you have a recurrent or long-standing inflammation/conjunctivitis of one or both eyes. Any person with a history of chronic conjunctivitis should get a chlamydial culture.[6] The patient is usually a teen-ager or young adult, whose is sexually active. The patient shows both follicles and papillae. The follicles may be dense on the inferior fornix. Small corneal subepithelial infiltrates may be visible in the periphery. The

patient may complain of a mucous discharge, redness, and generally irritated eye(s). The patient may have already seen his family doctor and been started on topical antibiotics or steroids to no avail.

Chlamydial conjunctivitis is generally diagnosed by the history, slit lamp, and lab tests. In your differential diagnosis, rule out other causes of chronic follicular conjunctivitis, especially medication toxicity.

Treatment

Chlamydia is a systemic disease, so it requires systemic treatment. The attempt to topically treat this disease is generally ineffective. You may destroy some chlamydial organisms on the ocular surface, but to get to the root of the problem you have to go systemic.[6] The treatment is a single daily dose of four 250 mg capsules of the macrolide antibiotic Zithromax (azithromycin). Zithromax works very well against chlamydia. The patient should be better in two to three days.[6]

The old approach to treatment was to prescribe tetracycline or erythromycin four times daily for 14-21 days. Many patients found this regimen burdensome and therefore compliance suffered.

The follow-up should be in one week, at which time you may discontinue the medication. There may still be inflammation signs, although most symptoms should be relieved. It may take months for all of the follicles to disappear. You also may want to set-up an appointment with the patient's family doctor, internist, or gynecologist for a urogenital exam. The patient should be advised of the situation, including the recommendation for appointments of sexual partners and possibly family members.

Common Bacterial and Viral Infections References

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