

Clinical & Refractive Optometry is pleased to present this continuing education (CE) article by Dr. Ron Melton and Dr. Randall Thomas entitled **Corneal Ulcers Versus Infiltrates**. In order to obtain a 1-hour Council of Optometric Practitioner Education (COPE) approved CE credit, please refer to page 350 for complete instructions.

Corneal Ulcers Versus Infiltrates

Ron Melton, OD; Randall Thomas, OD

Subjective

A 42-year-old woman with daily-wear soft lenses presented with a history of red right eye for two days. The eye was mildly uncomfortable. After the first day of redness, she discontinued lens wear and, when it appeared no better after the second day, she went to the doctor. She had been wearing soft lenses successfully for eight years and this had never happened before.

Objective

- Visual acuity (VA): 6/6 (20/20) OU
- Eye is injected, mostly in the superior nasal quadrant
- Cornea: clear except for a small, whitish, cloudy lesion near the periphery at the 2 o'clock position (Fig. 1)
- Anterior chamber: deep and clear. The lacrimal lake was clear and devoid of microparticulate debris. Fluorescein instillation revealed a pinpoint epithelial defect over the anterior stromal lesion (Fig. 2)

Assessment

- Infiltrative keratitis

Plan

- Dexamethasone/tobramycin (Tobradex) ophthalmic suspension q.2h. x 2 days, then q.i.d. x 5 days
- In office cyclopentolate hydrochloride (Cyclogyl) 1% 1 gt. OD
- Re-evaluate in 1 to 2 days
- Continue to wear eyeglasses until complete resolution, which was 1 week

Comments: The prime question in this situation is: "Is this an ulcer (microbial keratitis) or an infiltrate (sterile inflammation)?" All findings pointed to an infiltrate.

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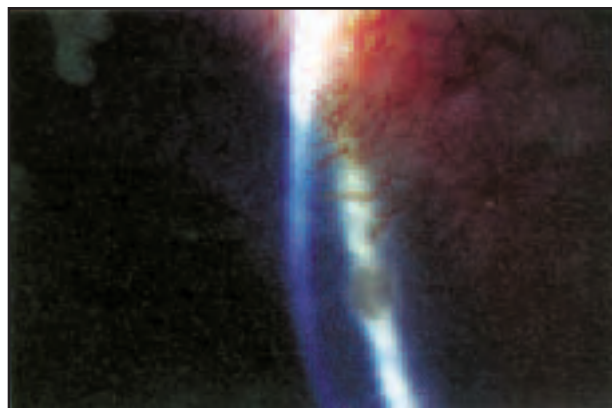


Fig. 1 This small lesion appearing near the limbus represents an infiltrate secondary to corneal hypoxia from contact lens wear.

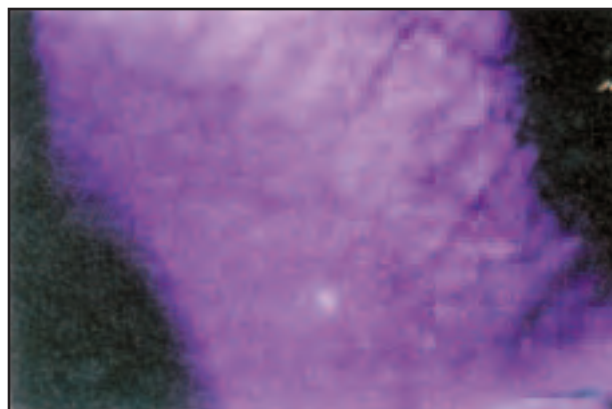


Fig. 2 Epithelial tissue compromise has occurred in this infiltrate resulting in a corneal defect that stains with fluorescein. With an infiltrate, the size of the epithelial defect is usually smaller than the underlying area of stromal infiltration.

Regarding therapy, a less clinically seasoned or more conservative practitioner may choose to treat with moxifloxacin 0.5% (Vigamox) or gatifloxacin 0.3% (Zymar) hourly for a day or two, and then finding no improvement in follow-up (and certainly no worsening since the offending lens is removed), add a steroid, and witness rapid resolution in 2 to 4 days. It must be remembered that infiltrates are common and ulcers are relatively rare. These ratios vary from practice to practice,

Table I Differential diagnosis of corneal ulcer versus infiltrate	
Ulcer (microbial keratitis)	Infiltrate (sterile inflammation)
Rare	Common
Usually painful	Mild pain
Tends to be central	Tends to be peripheral
1 to 1 staining defect/lesion ratio	Staining size relatively small
Cells in anterior chamber	No cells in anterior chamber
Generalized conjunctival injection	Sector skewed injection pattern
Usually solitary lesion	Can be multiple lesions
Underlying iris anatomy not clear	Iris detail clearly visible
Possible tear lake debris	Clear tear lake

depending in large part on the safety and compliance of daily-wear schedules versus extended-wear schedules of contact lens patients. We work diligently to educate our patients about the importance of complying with recommended wearing schedules. We have found that daily-wear, two-week replacement of lenses and one-day disposable lenses are virtually 100% safe, effective, and well accepted by our patients. Finally, studies have documented that commercially available topical ophthalmic fluoroquinolones are effective in the medical treatment of bacterial corneal ulcers.

Discussion

Table I shows the differential diagnosis of corneal ulcers versus infiltrates.

Corneal Ulcer

- Epidemiology: relatively rare
- Represents active bacterial infection
- Generally causes significant pain
- Tends to be central, rather than peripheral (*Staphylococcus* exotoxin “peripheral ulcers” are toxic/inflammatory epithelial defects)
- Size of the fluorescein epithelial staining defect closely mirrors the underlying stromal lesion
- Almost invariably a cellular inflammatory response in the anterior chamber
- Pattern of bulbar conjunctival injection is usually generalized, rather than sectorial
- Underlying iris anatomy is commonly obscured
- Treatment is aggressive use of a topical fluoroquinolone, possibly with antibiotic ointment at bedtime and daily follow-up until good control is achieved. Therapeutic cycloplegia with 5% homatropine or 0.25% scopolamine is usually wise
- Staining, cultures, and sensitivities are mandatory for large, central, vision-threatening ulcers. However, recent articles have shown that for less severe peripheral ulcers, the community standard-of-care is empirical intensive therapy with a fluoroquinolone

Corneal Infiltrate

- Epidemiology: relatively common; usually the result of hypoxia
 - Represents migration of inflammatory white blood cells from the limbal vasculature and precorneal tear film
 - Pain is mild to moderate; rarely marked
 - Tends to be peripheral because of the proximity of the cellular inflammatory mechanisms released from the limbal blood vessels
 - Size of the fluorescein epithelial staining defect is usually much smaller than the underlying stromal lesion. In any situation where there is stromal inflammation, it is a real challenge for the epithelial cells to remain physiologically intact. This explains why there can be some fluorescein staining in these stromal inflammatory responses
 - Secondary anterior chamber reaction is rarely elicited
 - Pattern of bulbar conjunctival injection is usually sectorial and proximally associated with the infiltrate. Even if there is 360° injection, the vascular injection pattern is skewed toward the sector nearer the infiltrate, particularly if it is peripherally located
 - Underlying iris anatomy is generally easily visualized
 - Two options for therapeutic approach:
 - (1) *If diagnosis is clear* — antibiotic/steroid combination such as tobramycin with dexamethasone, 1 gt. q.2h. x 2 days, then modify and taper p.r.n.
 - (2) *If diagnosis is unclear* — treat with a fluoroquinolone every 1 to 2 hours and follow up in 24 hours.
- If it is an ulcer, there may be no or minimal improvement at 24 hours; if the defect is an infiltrate, it will be the same or worse. At day 1 follow-up, the conservative antibiotic therapy can be continued for another day, or, if your diagnostic decision is now an infiltrate, then add a steroid such as rimexolone 1.0% (Vexol) q.i.d. while continuing the antibiotic.

Disclaimer: Not every detail of every case is discussed, rather the key clinical findings are described. For example, if nothing is said about the corneal status, you should assume that the cornea is normal, etc. When vision is recorded, it should be assumed to be best corrected or pinholed. Regarding therapy, we show how we treated the particular case. Given that medicine is an art, as well as a science, therapy will — and often does — vary with each unique patient presentation depending on severity, known drug allergies, prior treatment, response to therapy, etc.



INSTRUCTIONS FOR CE CREDITS

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Your answers will be sent for marking to the School of Optometry, University of Montreal, Quebec. If you score 70% or more, a COPE-approved CE Credit Certificate will be issued by the University of Montreal and *Clinical & Refractive Optometry* for your records and display in your office.

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QUESTIONNAIRE

Corneal Ulcers Versus Infiltrates

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1. Which of the following is **NOT** characteristic of infiltrative keratitis?
 - Severe pain
 - Usually central
 - Underlying iris anatomy not clear
 - Increased tearing
2. Which of the following is a **TRUE** statement describing this case?
 - The patient's visual acuity was not affected by her condition
 - The anterior chamber was deep and clear
 - There was an epithelial defect over the anterior stromal lesion
 - All of the above
3. Which of the following statements regarding treatment of infiltrative keratitis in this case is **FALSE**?
 - Dexamethasone/tobramycin (Tobradex) ophthalmic suspension q.2h. x 2 days, then q.i.d. x 5 days was prescribed
 - Moxifloxacin 0.5% (Vigamox) was first-line therapy
 - Eyeglasses rather than soft lenses for 1 week was recommended
 - In office cyclopentolate hydrochloride (Cyclogyl) 1% gt. OD was prescribed
4. Which of the following statements about corneal infiltrates is **TRUE**?
 - They are usually peripheral
 - Pattern of bulbar conjunctival injection is usually sectorial
 - Size of fluorescein epithelial staining defect is usually much smaller than underlying stromal lesion
 - Cellular inflammatory response in anterior chamber is usually present

5. Which of the following forms of contact lens use is safe, provided patients comply with recommended wear schedules?
- Two-week replacement of lenses
 - Daily-wear lenses
 - One-day disposable lenses
 - All of the above
6. Identify the characteristic **NOT** typical of infiltrates:
- 1 to 1 staining defect/lesion ratio
 - Staining size relatively small
 - Can be multiple lesions
 - Clear tear lake
7. Which of the following statements about corneal infiltrates is **FALSE**?
- Usually the result of hypoxia
 - Secondary anterior chamber reaction is rarely elicited
 - Pain is usually severe
 - Pattern of bulbar conjunctival injection is usually sectoral and proximally associated with the infiltrate
8. Which of the following statements about keratitis is **FALSE**?
- Diabetic patients are at high risk
 - Microbial keratitis typically occurs in older female patients
 - There is a genetic component to the condition
 - All of the above
9. Recommended treatment for corneal infiltrates does **NOT** include:
- Clear diagnosis: antibiotic/steroid combination, e.g. tobramycin with dexamethasone
 - Naproxen 500 mg b.i.d. for pain and inflammation
 - Unclear diagnosis: fluoroquinolone every 1-2 hours, with 24-hour follow-up
 - Day 1 follow-up: continue conservative antibiotic therapy
10. All of the following statements about corneal infiltrates are true, **EXCEPT**:
- The size of the fluorescein epithelial staining defect is usually smaller than the underlying area of stromal infiltration
 - They represent migration of inflammatory white blood cells from the limbal vasculature and precorneal tear film
 - The underlying iris anatomy is not easily visualized
 - They tend to be peripheral