Ring Infiltrate in *Staphylococcal* Keratitis

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**Key Word**: Ring infiltrate, *Staphylococcal* infection, Cornea, Keratitis

**Financial Support**: None.

**Conflict of Interest**: No conflicting relationship exists for any author.

**Running Head**: Corneal Ring Infiltrate

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ABSTRACT

Smear and culture of the corneal scrapings from a patient with a ring infiltrate confirmed significant growth of *Staphylococcus* species, resistant to fluoroquinolones. Due to non-response to medical management, patient underwent therapeutic penetrating keratoplasty. *Staphylococcus* infection of the cornea may present as ring like infiltrate and recalcitrant to medical management.
A 66-year-old man presented with complaints of sudden diminution of vision in his left eye for four days. He had undergone left eye punctoplasty for lower lid punctal stenosis in the past and was receiving treatment for chronic meibomitis. He also had a history of recurrent uveitis and secondary glaucoma in this eye. At the time of presentation, he was using loteprednol etabonate (0.5%) and brimonidine tartrate (0.2%) eye-drops twice daily.

During presentation his visual acuity was hand movement close to face. Corneal examination revealed a large epithelial defect measuring 8.0x7.5mm. Stromal ring infiltrate was present corresponding to the dimensions of the epithelial defect (Figure-1a,b). It was approximately 1.5mm wide and away from the limbus with associated surrounding stromal edema. The anterior chamber showed a hypopyon measuring 2mm in height. While KOH+CFW (10% potassium hydroxide with calcofluor white) stain did not show any organism, Gram stain showed plenty of polymorphonuclear cells and gram-positive cocci in groups.

The patient was put on fortified cefazolin (5%) and gatifloxacin (0.3%) eye-drops one-hourly. Culture grew *Staphylococcus* species (non-*S. aureus*) which was significant (consistent in direct microscopy result and confluent growth in two solid media), and sensitive to vancomycin, cefazolin and methicillin. Hence, cefazolin 5% eye drops were continued.

On subsequent follow-up, persistent epithelial defect of size >8mm in all dimensions, deep stromal ring infiltrate and hypopyon remained same. Loteprednol etabonate eye-drop four-times daily was added on 5th day of presentation for control of inflammatory component along with intensive lubrication. It was tapered over a period of four weeks. A repeat corneal scraping, 26 days after presentation, revealed no organisms in direct smear by Gram and KOH+CFW staining as well as in culture. Finally, with the failure in resolution of clinical signs and symptoms, the patient was given the option of left eye therapeutic penetrating keratoplasty.

Culture of the corneal tissue for bacteria, fungus and *Acanthamoeba* did not grow any organism. The histopathology evaluation of the corneal tissue showed completely denuded epithelium with continuous Bowman's membrane. Stroma showed diffuse loss of fibrokeratocytic nuclei in stroma (Figure-1c,d). Peripheral stroma showed presence of plump myofibroblastic cells. Central and paracentral corneal stroma showed patchy stromal necrosis.
with eosinophilic granular debris between the stromal fibres. Descemet's membrane was
continuous with occasional subendothelial polymorphonuclear cells. Special stains did not show
any organism.

Postoperatively, there was large epithelial defect in the graft, which was managed with
bandage contact lens. At his last follow-up, the visual acuity was 20/125 with a clear graft.

DISCUSSION

Corneal ring infiltrates have been described to occur in infections by a variety of organisms.
These include Acanthamoeba, gram-negative bacilli like Pseudomonas aeruginosa or
Moraxella, herpes simplex virus, fungi, varicella zoster virus, as well as immune-related
conditions like rheumatoid arthritis.1-3 Corneal ring infiltrates are most consistently associated
with Acanthamoeba keratitis. Ring infiltrate has been reported after corneal collagen
crosslinking procedure with postoperative use of contact lens due to polymicrobial infection
caused by Streptococcus salivarius, Streptococcus oralis, and coagulase-negative
Staphylococcus sp.4 We report an atypical case of corneal ring infiltrate associated with
Staphylococcus infection with an unusual clinical course.

Staphylococcus keratitis occurs more frequently in compromised cornea such as bullous
keratopathy, chronic herpetic keratitis, keratoconjunctivitis sicca, etc. While S. aureus tends to
produce a rapidly progressive corneal infiltration and moderate anterior chamber reaction with
hypopyon, Staphylococcus species other than S. aureus tend to progress slowly and present as
superficial localised infiltrate. Although Staphylococcus has been known to cause ring
infiltrates, it is uncommon and there are limited reports of such cases.5,6 More interesting was
the clinical course of the disease in this patient, where a persistence of the epithelial defect and
infiltrate despite medical therapy, presented a diagnostic and therapeutic dilemma.

Ring infiltration with Staphylococcus is thought to be immune-mediated in pathogenesis. It
is a type III hypersensitivity reaction to staphylococcal antigens or toxins, resulting in
complement activation and influx of polymorphonuclear leucocytes and mononuclear cells that
form the infiltrate.7 Clinically, differentiating an infective infiltrate from a sterile infiltrate is
difficult, although the management differs significantly in the two. While infective cases would
be associated with pain, suppuration, larger epithelial defects with anterior chamber reactions,
sterile infiltrates would be milder in signs and symptoms, and not usually associated with
epithelial defects of greater than 2mm.\textsuperscript{8}

In our patient, risk factor of chronic meibomitis was present, which is most commonly
associated with marginal infiltrate by \textit{Staphylococcus} infection, and perhaps a localised
immunocompromised state from chronic topical steroid use. Despite in-vitro susceptibility-
based treatment and steroid cover for any immunological component, the patient did not
respond to the treatment. Repeat microbiological evaluation and culture of the corneal tissue
failed to reveal any organism, while histopathology showed a non-specific stromal necrosis with
absence of any inflammatory infiltrate. This might be due to chronic steroid use causing
localized immune-suppression.

Significant growth of \textit{Staphylococcus} in culture and non-response to steroid treatment in
our patient has proven that there is absence of immunologic component in the pathogenesis of
the ring infiltrate. The multidrug resistance may be an association or a coincidental finding of
ring infiltrate.
REFERENCES


FIGURE LEGENDS

FIGURE-1

Slit-lamp photograph showing ring infiltrate in: (a) Diffuse illumination, and (b) Slit-view. (c) Corneal stroma showing diffuse loss of fibrokeratocytic nuclei with complete absence of inflammatory cells (Periodic Acid-Schiff stain, x100); (d) Eosinophilic granular debris between the stromal fibres (Hematoxylin and Eosin stain, x400).