**STANDARD OPERATING PROCEDURES**

**CORNEAL ULCER**

1. **HISTORY :**
* Following points pertaining to the presenting complaints will be obtained:
* Pain, redness, foreign body sensation, watering, photophobia and blurred vision
* Onset of the disease : Acute or chronic
* History with regards to nature of trauma and Trauma with vegetable matter such as paddy husks or onions are more likely to cause a fungal keratitis
* Contact with contaminated or brackish water is likely to produce Acanthamoeba keratitis
* Use of Traditional Eye Medicine or over the counter medication if any
* In cases of contact lens wearers, it is imperative to take history of wearing schedule and lens care
* Occupation of the patient : Farmer, animal handler, gardener
* Prior Ocular surgery, Allergic disorders, topical medications, lid and adnexal infections, dry eye
* History of any systemic illness-Diabetes, Connective tissue disorders, Rheumatoid arthritis, Tuberculosis etc

 **2. EXAMINATION :**

 **2.1.Visual Acuity measurement :**

* UCVA at the time of presentation and also at subsequent follow up visits is important to monitor the severity and the progress of the ulcer

 **2.2. External Examination :**

* Facial examination
* Proptosis
* Eyelids – Coloboma, ectropion, entropion, lid lag, lagophthalmos,
* Lacrimal Sac Area
* Corneal sensation: Sterile Cotton wisp

 **2.3. Slit-lamp Biomicroscopic Examination :**

* **Eyelid margins:** Inflammation, ulceration, eyelash abnormalities including trichiasis, lacrimal punctal anomalies. Eyelid eversion and double eversion to find and remove any foreign body
* **Conjunctiva:** Discharge, inflammation, morphologic alterations (e.g. follicles, papillae, membrane, pseudomembrane and foreign bodies)
* **Sclera:** Inflammation, thinning, nodules
* **Cornea:**
* Fluorescein staining of the cornea is performed and stained epithelial defect is examined using the cobalt blue light of the slit lamp. Size of Epithelial defect is measured separately in two largest meridian May provide additional information about other factors, such as the presence of dendrites, pseudodendrites, loose or exposed sutures, foreign body
* Location, size, shape and margins of corneal ulcer to be marked on a schematic diagram
* Bacterial keratitis include dense suppurative stromal infiltrate with distinct edges and edema . Stromal thinning, perforation, and characteristics of infiltrate [suppuration, necrosis, feathery, soft, crystalline]
* Fungal keratitis presents with dry raised surface and feathery indistinct margins. Accompanying satellite lesions may be present in few cases. Big hypopyon is present.
* Viral Keratitis presents as punctuate epithelial keratitis, dendritic ulcer or geographical ulcer. Stromal keratitis in the form of disciform keratitis may be present.
* Acanthamoeba keratitis usually presents with a ring shaped stromal infiltrate
* Quadrant wise record of corneal vascularisation should be made
* **Anterior Chamber :**
* AC reaction may vary from mild flare and cells to severe hypopyon formation
* Record of hypopyon and its characteristics should be made
* Fixed immobile hypopyon is a feature of fungal keratitis
* **Iris :**
	+ Synechiae formation
		- If ulcer perforates, uveal prolapse occurs and this may later form corneoiridic scar
* **Pupil and Lens :**
* Any abnormality in pupil size, shape and location
* Lens should be examined for the presence of cataract or any other abnormality
* **Posterior Segment :**
* Usually it is difficult to view vitreous and retina in case of corneal ulcer
* B-Scan USG will be done in cases of suspected endophthalmitis
* **Intraocular Pressure**
* Digital tonometry is the most practical method

 **3. INVESTIGATIONS :**

 **3.1.Microbiological investigations:**

* The following samples will be collected at the initial presentation prior to the start of anti-microbial therapy :
* Conjuctival swab
* Corneal scrapings :
* Topical anaesthetic agent (4% lignocaine) is instilled
* Sterile Bard Parker blade or Kimura’s spatula will be used
* Lid speculum is applied gently
* Any mucous or debris on and around the ulcer is carefully cleaned with sterile swab stick
* Then the leading edges and base of ulcer are scraped
* Material is then directly inoculated into the culture media
* Two smears are initially prepared – one with Gram’s stain (for identifying bacteria, fungi, and Acanthamoeba) and the other with 10% potassium hydroxide (for fungus)
* Additional smears may be prepared for special stains like Giemsa, Periodic Acid Schiff, Calcofluor or Gomori modified Methenamine Silver Stain
* **Recommended Stains and Culture media for Microbial Keratitis :**
* Aerobic bacteria : Gram’s Stain, Blood agar , Chocolate agar

 Thioglycollate broth

* Anaerobic bacteria : Gram’s Stain, Anaerobic blood agar
* Mycobacteria : Acid fast Lowenstein – Jenson Medium
* Fungi : 10 % KOH Blood agar , Sabouraud’s Dextrose agar
* Acanthamoeba :10 % KOH

 **3.2. Biochemical investigations:**

* A baseline evaluation for diabetes mellitus should be performed
* In case of Peripheral Ulcerative Keratitis : CBC, RA Factor, ACE, ANA, Mantoux test, FTA-Abs

**4. TREATMENT:**

* The treatment strategy would be guided by the microbiological investigations and the clinical appearance of the ulcer
* Empirical treatment will be started after the scrapings have been sent for examination
* **Subsequently depending upon smear and culture findings treatment is modified**
* **Bacterial Keratitis:**
* Fortified Cefazoline 5 % and Fortified Tobramycin 1.3% :
* Loading dose every 5 to 15 minutes during the first hour, followed by ½ hourly instillation during waking hours and 2 hourly during night for the first 48 hours is recommended. Thereafter 1 hourly instillation is recommended depending upon the response
* Atropine 1 % eye drops 3 times a day
* T.Acetazolamide 250mg or Timolol 0.5% drops as required
* Systemic Analgesics and Anti-inflammatory drugs

* **Fungal Keratitis :**
* Natamycin 2 % eye drops are given 1 hourly
* Tab. Itraconazole 100 mg BD after LFTs
* Voriconazole 1% drops will be used in the treatment of filamentous fungi
* Non specific treatment as for bacterial keratitis
* **Viral Keratitis :**
* Tab.Acyclovir 800mg for 5 times a day
* Ointment Acyclovir 3% for local application 5 times a day
* Non specific treatment as for bacterial keratitis
* **Preparation of fortified antibiotics:**
* **Gentamicin and Tobramycin :**
* Add 2 ml of injectable Gentamicin or Tobramycin to 5 ml commercial topical preparation in a sterile set up using disposable syringe.

5 ml commercial has - 15 mg

Added drug - 80 mg

Total in 7 ml - 95 mg

1 cc contains 13.5 mg or 1.35%

* **Cefazoline:**
* Add 10ml of distilled water or sterile saline to 500 mg vial of Cefazoline to obtain 5% solution
* **Vancomycin:**
* Add 10 ml distilled water or saline to 500mg vial of Vancomycin and obtain a 5% solution
* **Daily evaluation with Slit lamp documentation will be done and topical therapy will be tapered according to the clinical response**
* Several features suggest the response to antimicrobial therapy :
* Decreased pain
* Visual improvement
* Reduction in congestion of bulbar conjunctiva
* Consolidation and sharper demarcation of the periphery of the stromal infiltrate
* Decreased density of the stromal infiltrate
* Reduction of stromal edema and endothelial inflammatory plaque
* Dilatation of the pupil
* Re-epithelialization
* , taking into account the baseline clinical picture and the virulence of the pathogen