

A CLINICAL STUDY OF SUPPURATIVE KERATITIS

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ABSTRACT

BACKGROUND

Corneal blindness is a major problem in India. Corneal ulcer patients top the list among diseases causing corneal blindness and remain a liability to the family and community for the rest of their lives. Hence there is a need to find out the common causes of corneal diseases and to evaluate the effectiveness of treatment against them to prevent the dreadful complications.

MATERIALS AND METHODS

50 patients of corneal ulcer were included in the study. Based on lab report, corneal ulcers were divided into bacterial, fungal, protozoal.

RESULTS

Results are presented under the following headings- Sociodemographic Profile, Risk Factors, Clinical Characteristics, Laboratory Diagnosis, Treatment and Outcome.

CONCLUSION

Fungal ulcers are more common than bacterial ulcers. Filamentous fungi and Staphylococcus aureus were the most common fungi and bacteria respectively. Most community acquired suppurative ulcers resolve with appropriate treatment. Delay in diagnosis probably contributes to poorer outcome from therapeutic measures. These findings have important public health implications for the treatment, rapid referral, diagnosis, and prevention of corneal ulceration in the developing world.

KEY WORDS

Bacterial Keratitis, Fungal Keratitis, Acanthamoeba Keratitis, Suppurative Keratitis, Corneal Ulcer, Filamentous Fungi, Staphylococcus aureus.

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BACKGROUND

In India, there are about 12 million blind people.⁽¹⁾ The incidence of corneal blindness is 15.4%, the corneal ulcer contributing 9.34%.⁽²⁾ Corneal blindness is a major problem in India. Corneal blindness is a disaster because majority of the corneally blind remain a liability to the family and community for the rest of their lives.

Definition

Suppurative keratitis defined as a defect in the corneal epithelium with infiltration of underlying and surrounding stroma associated with signs of inflammation (with or without hypopyon) with super added infection.⁽³⁾

In this includes patients with bacterial keratitis, fungal keratitis and protozoal keratitis.

Bacterial Keratitis

Clinical features suggestive of bacterial keratitis include dense suppurative stromal infiltrate with indistinct edges, oedema, and white cell infiltration into surrounding stroma. An epithelial defect is typically but not necessarily present.

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The microbial organisms that usually produce these severe and rapidly progressive corneal ulcers include S.aureus, S. pneumoniae, haemolytic streptococcus and P. aeruginosa. Less severe or slowly progressive corneal ulcers usually are caused by organisms such as coagulase – negative staphylococcus, S. viridans, Actinomyces, Nocardia, Moraxella, and Serratia.

Fungal Keratitis

Suppurative keratitis occurs more often after a superficial corneal trauma with vegetative or organic materials.⁽⁴⁾

Fungal ulcers are more common than the bacterial ulcers. Aspergillus species and staphylococcus were the most common fungus and bacteria respectively.⁽⁵⁾

Aspergillus and Fusarium are the two most common organisms associated with corneal ulcer with hypopyon. These ulcers typically have dry, raised ulcer with crenate, spiculate or pseudohyphate border; satellite lesions; immune ring in surrounding lesion, recurrent hypopyon or posterior chamber endophthalmitis with progressive shallowing of the anterior chamber; failure to respond to antibacterial treatment. The signs are more than the symptoms and sometimes endothelial plaques are seen and the hypopyon is thick fibrinous and the upper level is irregular.^{(6),(7)}

Acanthamoeba Keratitis

Acanthamoeba are ubiquitous, free living protozoa. All types of contact lenses have been associated with acanthamoeba keratitis, particularly daily wear soft contact lenses. Symptoms unusually severe pain predominantly unilateral. Insidious onset, chronic course with remissions and exacerbations before breaking in to frank suppurative keratitis. Unsuccessful

treatment by many Ophthalmologists is an important clue.⁽⁸⁾

The present study is undertaken to evaluate the current concepts of the aetiology, clinical characteristics, pathogenesis, microbiologic work up and management of suppurative keratitis.

Aims of investigation were to improve facilities for laboratory diagnosis, to determine predominant causative microorganisms, to identify most suitable treatment and encourage rapid referral of patients.

Aims and Objectives

1. To find out the common causes and clinical characteristics of suppurative keratitis.
2. To evaluate the adequacy of current therapy available in treating suppurative keratitis.

MATERIALS AND METHODS

Study Design

Prospective observational study.

Study Population

50 patients with suppurative keratitis who attended the ophthalmic OPD and were admitted to the wards in a tertiary care hospital located in South India.

Study Period

The study was conducted from April 2016 to March 2018.

Patients presenting with suspected suppurative keratitis irrespective of their age and sex were included in this study. Patients with suspected or confirmed viral keratitis and other corneal abnormalities were excluded from this study.

A detailed ocular examination was carried out using torch and magnifying glass and slit lamp. Special attention was paid to the status of the ulcer - its site, size, shape, surface: elevation or depression, dry or moist, floor whether covered with slough or not and edges regular or frayed. Corneal vascularization and corneal sensation were noted. Ulcer was stained with 2% fluorescein to know the extent and the details of the ulcer. The amount of hypopyon in anterior chamber whether quarter or less, one-third, two-thirds or full, its colour whether creamy white or mixed with blood, and consistency whether fluid or fibrinous were noted, along with shape of upper level. The depth of the ulcer was determined by the slit lamp. Lacrimal sac patency was checked by doing sac syringing. Laboratory investigations included urine examination for albumin, sugar, microscopy, blood for FBS/RBS.

Corneal ulcer scrapings were taken for Gram's stain, 10%, KOH mount and culture and sensitivity for bacterial or fungal organism in blood agar, MacConkey medium and Sabouraud dextrose agar. In cases associated with chronic dacryocystitis, DCT was done.

In threatened perforation, conjunctival hooding and therapeutic keratoplasty were done. When the defect was epithelialized antibiotic ointment was used in bacterial ulcers instead of fortified antibiotic drops, because the ointment provides antibiotic coverage as well as an emollient effect.

Statistical Methods

The study patients were described according to their demographic profiles such as age, gender, occupation, risk factors, nature of injury, incidence of chronic dacryocystitis,

prior use of drugs and clinical characteristics. The statistical procedures were performed by the statistical package namely IBM SPSS statistics-20 and p-value was calculated using chi-square test.

RESULTS

Results are presented in the following headings

1. Socio demographic profile.
2. Risk factors.
3. Clinical characteristics.
4. Laboratory diagnosis.
5. Treatment and outcome.

1. Socio Demographic Profile

Sex Distribution

Among the 50 cases studied, 32 were male and 18 were female. Sex distribution was 64% male and 36% female.

Age Distribution

The incidence of suppurative keratitis was more between the age of 31 to 60 years. 44 cases (88%) were between 31- 60 years of age and 6 cases (12%) between 11-30 years of age.

Occupation

Out of 50 cases, 26 cases (52%) were agriculture workers, 14 cases (28%) were housewives, 4 cases (8%) were industrial workers, 3 cases (6%) were merchants, 1 case (2%) was student and 2 cases (4%) were others.

2. Risk Factors

Out of 50 cases, 33 cases (66%) had trauma, 5 cases (10%) had trauma plus chronic dacryocystitis, 2 cases (4%) had chronic dacryocystitis, 1 case (2%) had trichiasis and 9 cases (18%) had no predisposing risk factor.

Nature of Injury

Out of the 50 cases, 76% gave history of injury of which 14 cases (28%) had injury with objects like stone, metal piece, insect, ash powder dust and cow tail. 12 cases (24%) was injury with vegetable matter, 6 cases (12%) had penetrating injury and 6 cases (12%) had wooden piece injury.

Injury is more common in agricultural workers (26 cases). Occupation of patients showed statistically significant association with nature of injury

$$X^2 = 40.36, P \text{ value: } 0.004 (S)$$

Sex is not statistically significant with the nature of injury.

Incidence of Chronic Dacryocystitis

In our study, 7 persons had chronic dacryocystitis, 2 females (28.5 %) and 5 males (71.45 %). All underwent dacryocystectomy.

Prior use of Drugs

In our study, 42% of patients had already applied some antibiotics antifungal before coming to this Hospital, 50% of them had taken no treatment at all.

3. Clinical Characteristics

Clinical characteristics analysed only in confirmed bacterial (14 cases) and fungal (16 cases) keratitis.

Analysis of Clinical Features in Fungal and Bacterial Keratitis

Time interval between injury to onset of symptoms in fungal keratitis 10-20 days in 62.5% of cases and in bacterial keratitis 1-10 days in 78.5% of cases. Features of corneal ulcer raised slough, dry in 81.2% of fungal keratitis and yellowish to greyish white purulent slough in 71.4% of bacterial keratitis cases. Satellite lesions seen in 62.5% of fungal keratitis cases.

Hypopyon was present in 87.5% of fungal 64.28% of bacterial keratitis case.

Stage of corneal ulcer at presentation is moderate in 56.25% of fungal keratitis and mild in 42.85% bacterial keratitis. This may be because of bacterial keratitis symptoms more marked than fungal keratitis.

Grades of Corneal Ulcer

In our study, out of 50 cases 42% of cases fell into the mild group, 44% of cases fell into moderate group while 14% of cases were of severe category.

4. Laboratory Diagnosis

Microbiological Characteristics

Among 50 cases of suppurative keratitis, *Fusarium* accounts for majority of infection (18%), *Staphylococcus aureus* forms the main pathogenic bacterial organisms (16%). In 40% of cases there was no growth.

Out of 40% culture negative cases, 10% negative for both Gram stain and 10% KOH mount, 10% positive for both Gram stain and 10% KOH mount. 14% positive for Gram stain in that 8% Gram positive 6% Gram negative and 6% positive for KOH mount and negative for Gram stain.

5. Treatment and Clinical Outcome

Antimicrobial Therapy

All 50 cases were treated with antimicrobial medical therapy. In that 21 Gram stain smear positive cases treated with commercially available broad-spectrum antibiotics. Fluoroquinolones 0.3% like ciprofloxacin, ofloxacin, gatifloxacin, moxifloxacin and sparfloxacin were the main drug of choice in our study. Almost 18 cases (85.71%) of bacterial keratitis treated with these eye drops showed favourable response. 1 case of Fluoroquinolone resistant *Pseudomonas* was treated with Tobramycin 0.3% eye drops and sub conjunctival injection of Gentamycin 20 mg in 0.5 ml and 1 case of *S. pneumoniae* treated with fortified cefazolin 50 mg/ml eye drops and sub conjunctival injection Gentamycin 20 mg in 0.5 ml. 1 case of *S.aureus* eventually underwent evisceration

Antifungal Therapy

Out of 50 cases 19 cases were KOH mount positive and 16 were fungal culture positive. Natamycin considered as drug of choice for all KOH mount positive cases. 12 cases (63.16%) of culture positive cured completely with only Natamycin and in 6 cases (31.57%), azoles (Fluconazole 2% or Itraconazole) added as second agent. Out of 7 *Aspergillus* culture positive cases, 4 (57%) responded well to Natamycin and out of 9 *Fusarium* culture positive cases 7 (77.7%) responded well to Natamycin. 2 *Aspergillus* culture positive cases underwent evisceration.

However out of 50 cases 6 patients required surgical

management. 1 patient underwent therapeutic penetrating keratoplasty and 2 patients underwent conjunctival hooding. 3 cases eventually required evisceration.

Complications and Sequelae of Suppurative Keratitis in Study Subjects

The predominant outcome was a corneal scar with or without vascularisation (45(90%) of 50 followed cases). Of the 50 cases of suppurative keratitis studied in this series, 9 cases ended up with nebular, 27 cases with macular and 9 cases with leucomatous opacity with vascularisation. Complications of suppurative keratitis noted in 5 patients (10%). 1 case (2%) ended in perforation underwent Therapeutic penetrating keratoplasty, 3 cases (6%) lead to panophthalmitis and 1 case (2%) resulted in anterior staphyloma. Out of 3 panophthalmitis cases 1 was positive for *Aspergillus*, 1 was for *S.aureus* on culture and 1 was no growth. All 3 cases not responded to the treatment underwent evisceration.

Location of Opacities in 47 Cases of Suppurative Keratitis in Study Subjects

In our study, out of 47 cases, 32 cases (68.09%) opacities were central, 15 cases (31.91%) opacities were peripheral and 3 cases underwent evisceration.

Visual Impairment

In our study, majority of the patients had central corneal ulcer (68.09%). Residual visual acuity ranged from mere perception of light to counting fingers at 4 meters distance. In paracentral corneal ulcers visual acuity was as good as 6/60-6/36.

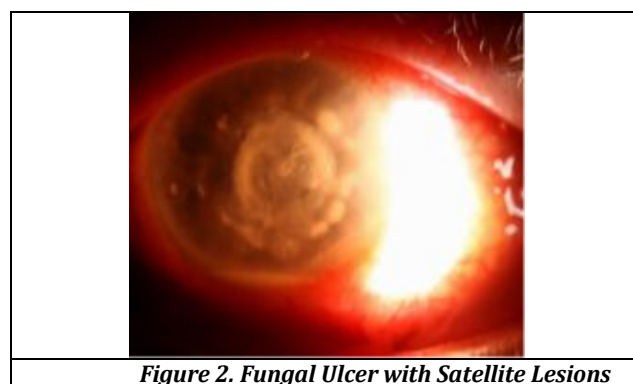




Figure 3. Descemetocele



Figure 4. Buff Coloured Colonies on SDA

Sl. No.	Micro-Organisms	No. of Cases	%
1	Fusarium	9	18
2	Aspergillus	7	14
3	Staphylococcus aureus	8	16
4	Pseudomonas	2	4
5	Streptococcus pneumoniae	2	4
6	Staphylococcus epidermidis	2	4
7	No Growth	20	40
Total		50	100

Table 1. Microbiological Characteristics

Sl. No.	End Result	No. of Cases	%
1	Nebula	9	18
2	Macula	27	54
3	Leucoma	9	18
4	Perforation and Pseudo Cornea	1	2
5	Panophthalmitis	3	6
6	Anterior Staphyloma	1	2
Total		50	100

Table 2. Complication and Sequelae of Suppurative Keratitis in Study Subjects

DISCUSSION

Infectious keratitis is one of the major causes of avoidable blindness. It is the second most common cause of monocular blindness, after unoperated cataract. Corneal ulcer when occurring centrally causes significant impairment of vision.

1. Socio Demographic Profile

Sex Distribution

In this study incidence of microbial keratitis was higher in males (64%) than females. This study correlated with another study by Gonzales CA and Srinivasan et al,⁽⁹⁾ out of 1148 cases of corneal ulceration, the ratio of male to female patients was 1.6:1.0. It also correlates with another study by

M Jayahar Bharathi et al⁽¹⁰⁾ where males (65.08%) were more often affected.

This study did not correlate with a study done by Upadhyay MP et al⁽¹¹⁾ on 405 patients with corneal ulceration, in which males and females were equally affected.

Age Distribution

In the present study the incidence of suppurative keratitis was more between the age of 31 to 60 years, among 50 patients of our study 37 patients (74%) are in that group i.e., working age.

Our study correlated with M Jayahar Bharathi, et al,⁽¹⁰⁾ which concluded that a large proportion of the patients (732; 66.85%) were in the younger age group (21 to 50 years).

Occupation

In the present study the incidence of suppurative keratitis was more in agricultural workers. Among 50 patients of our study 26 patients (52%) belong to agriculture background as patients visiting to our hospital are mostly from rural area. This is similar to other south Indian studies like Srinivasan et al,⁽⁹⁾ M Jayahar Bharathi, et al,⁽¹⁰⁾ Samar K et al study.⁽⁵⁾

2. Risk Factors

In our study occupation of patients showed statistically significant association with nature of injury ($\chi^2 = 40.36$, p value= 0.004(S)). Sex of the study subjects showed clinical significance but did not show statistical significance with nature of injury. This might be because of the smaller sample size (n=50) in our study ($\chi^2 = 9.129$, p value=0.058)

The same was concluded by various other studies by Upadhyay MP et al⁽¹¹⁾ who concluded that the most common predisposing cause of ulceration was corneal trauma, usually with organic agricultural materials.

Srinivasan M, Gonzales CA et al⁽⁴⁾ in their study evaluated that central corneal ulceration is a common problem in south India and most often occurs after a superficial corneal injury with organic material.

Prior Medication

Many of the patients presented late for medical attention in our study and this may be because of illiteracy, ignorance or poverty, 50% of the patients in our study had started on topical medication before their initial medical examination.

3. Clinical Characteristics

In our study common clinical characteristics of Bacterial keratitis were short duration of history, greyish white with curdy purulent slough in 71.4% cases.

In fungal corneal ulcer, long duration of history, dry, raised necrotic slough were important features of corneal ulcer in 81.2% of cases and satellite lesions in 62.5% of cases. All are similar to south Indian study conducted by P A Thomas, A K Leck et al.⁽⁷⁾ in which serrated margins, raised slough, dry texture, satellite lesions and coloration other than yellow occurred more frequently in cases of filamentous fungal keratitis than bacterial keratitis (p, 0.05).

In the present study hypopyon was more frequently observed in fungal (87.5%) than in bacterial (64.28%) keratitis. This figure is unlike with south Indian study conducted by P A Thomas, A K Leck, et al⁽⁷⁾ in which hypopyon and fibrinous exudate were observed more frequently in bacterial keratitis (p, 0.05).

4. Laboratory Diagnosis

Diagnostic Methods

In our study for all the patients with corneal ulcers we followed standard methods of microbiological examinations that includes Scraping with bard parker blade, smears taken on glass slides for grams staining and 10% KOH mount, Culture sensitivity test by using standard culture media.

Jacob P, Gopinadhan U et al⁽¹²⁾ conducted a prospective comparative evaluation of Bard Parker blade no. 15 and calcium alginate swab for the collection of corneal material. Their study concluded that Replacement of blade with calcium alginate swab did not appear to be advantageous for the investigation of infectious keratitis.

Most Common Microorganisms

Out of the 50 cases of suppurative keratitis in this study 30 (60%) cases of corneal scrapings were culture positive. Fungus (32%) accounts for majority of infection, than the bacteria (28%)

In 40% of the cases, the report came as sterile. The reason may be due to prior treatment with antibiotics or a viral or acanthamoeba infection,

In a study by T. Bourcier, F Thomas et al⁽¹³⁾ 300 cases (291 patients) of presumed bacterial keratitis, an organism was identified in 201 eyes (68%). 83% of the infections involved Gram positive bacteria, 17% involved Gram-negative bacteria, and 2% were polymicrobial.

In a study on Epidemiological Characteristics and Laboratory Diagnosis of Fungal Keratitis by M Jayahar Bharathi et al,⁽¹⁰⁾ Fungal aetiology were confirmed in 34.4% of corneal ulcers. The predominant fungal species isolated was *Fusarium* spp. (42.82%) followed by *Aspergillus* spp. (26%)

5. Treatment and Clinical Outcome

Medical Treatment

All 50 cases were treated with antimicrobial medical therapy. In that 21 Gram stain smear positive cases treated with commercially available broad-spectrum antibiotics. Fluoroquinolones 0.3% like ciprofloxacin, ofloxacin, gatifloxacin, moxifloxacin and sparfloxacin were the main drug of choice in our study.

Out of 50 cases 19 cases were KOH mount positive and 16 were fungal culture positive. Natamycin considered as drug of choice for all KOH mount positive cases. 12 cases (63.15%) cured completely with only Natamycin and 6 cases azoles (Fluconazole 2% or Itraconazole) added as second agent. Out of 7 *Aspergillus* culture positive cases 4 (57.14%) responded well to Natamycin and out of 9 *Fusarium* culture positive cases 7 (77.7%) responded well to Natamycin. 2 *Aspergillus* culture positives underwent evisceration.

Surgical Management

In our study out of 50 cases 6 patients required surgical management. 1 patient underwent therapeutic penetrating keratoplasty and 2 patients underwent conjunctival hooding. 3 cases eventually required evisceration.

Out Come

In our study the predominant outcome was a corneal scar with or without vascularisation (45(90%) of 50 followed cases). Of the 50 cases of suppurative keratitis studied in this series, 9 cases ended up with nebular, 27 cases with macular

and 9 cases with leucomatous opacity with vascularisation.

In our study, out of 47 cases, opacities of 32 cases were central, 15 cases were peripheral, and 3 cases underwent evisceration.

Visual Impairment

In our study, majority of the patients had central corneal ulcer (68.09%). Residual visual acuity ranged from mere perception of light to counting fingers at 4 meters distance. In paracentral and peripheral corneal ulcers visual acuity was as good as 6/60-6/36.

CONCLUSION

Central corneal ulceration is a common problem in developing countries. It most often occurs after a superficial corneal trauma with vegetative or organic materials. Fungal ulcers are more common than bacterial ulcers. Filamentous fungi and *Staphylococcus aureus* were the most common fungi and bacteria respectively.

Microbiological investigations should be performed whenever possible; however where facilities are not available, a rapid presumptive diagnosis of suppurative keratitis may be possible by a knowledge of the local aetiology within a region and by assessing common clinical characteristics.

Most community acquired suppurative ulcers resolve with appropriate treatment. Delay in diagnosis probably contributes to poorer outcome from therapeutic measures.

These findings have important public health implications for the treatment, rapid referral, diagnosis, and prevention of corneal ulceration in the developing world.

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