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Original Research Article

A Clinical Study of Suppurative Keratitis

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Abstract

Objectives: To find out the aetiological agents and clinical features of suppurative keratitis and to evaluate the adequacy of current therapy available in treating suppurative keratitis**.**

Materials and Methods: These study included100 patients with microbial keratitis who attended the ophthalmology OPD and were admitted to the hospital attached to JJM Medical College, between March 2014 to January 2015. All patients were evaluated in detail for demographic data, clinical features and management.

Results: The sex incidence was 60% male and 40% female. The incidence of suppurative keratitis was more between the ages of 20 and 60 years (80%). Trauma contributed to 72% of corneal ulcer while there was no history of trauma in 28% of cases. Filamentous fungi (Fusarium and Aspergillus) accounts for the majority of infections (45%) while *Staphylococcus aureus* form the main pathogenic bacterial organism (15%). All 100 cases were treated with antimicrobial therapy. 8 patients (8%) required surgical management. 2 (2%) patients underwent therapeutic penetrating keratoplasty and 6(6%) cases eventually required eviscereation.

Conclusion: Fungal keratitis is more common than bacterial keratitis. Filamentous fungi (Aspergillus and Fusarium) and *Staphylococcus aureus* were the most common fungi and bacteria respectively. A rapid presumptive diagnosis of suppurative keratitis may be made possible 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.

Keywords: suppurative keratitis, corneal ulcer, fungal keratitis, bacterial keratitis

1.Introduction

Microbial infections of the cornea are among the major causes of monocular blindness in developing countries like India [1,2]. Corneal ulceration can progress rapidly, threatening the integrity of the eye and producing significant tissue destruction.

The severity of the ulceration is dependent upon - the virulence of the organism, the integrity of the host defense mechanisms and promptness of appropriate medical attention. The epidemiological pattern and causative agents for suppurative corneal ulcer varies significantly from country to country, and even from region to region within the same country[1]. In order to develop a comprehensive strategy for the diagnosis, treatment, and ultimately for the prevention of corneal infections, the aetiological factors predisposing to ulceration and the pathogenic organisms which are responsible must be determined.[1]

Ulcerative keratitis must be considered an urgent problem. Early recognition with prompt work up and rapid institution of appropriate therapy would significantly improve the visual prognosis. The availability of a number of very potent antibiotics, antifungal and antiamoebic medication with specific efficacy against different bacterial, fungal and protozoal organisms has certainly made the outcome of many of these cases favorable,

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

2. Materials and methods

The present study was a randomized prospective study involving 100 patients of microbial keratitis of all ages and both sexeswho attended the ophthalmology OPD and were admitted to the hospital attached to JJM Medical College, between March 2014 to January 2015.Patients with suspected or confirmed viral keratitis and other keratitis were excluded from this study.

A detailed case report was taken with special reference to age of the patient, cause of injury, history of prior treatment and history suggestive of a source of infection in the

eye and entered in to a standardized clinical proforma. A detailed clinical examination was carried out which included visual acuity and examination of the ulcer with slit lamp. Special attention was paid to the morphology of the ulcer - its location, margin, surface, colour, texture, floor, area around the ulcer and presence of vascularization. Corneal sensation was examined. The anterior chamber was examined for cells and flare. Hypopyon if present was analysed for height, mobility, consistency and shape of upper level. Ulcer is stained with 2% flourescein to know the extent and the details of the ulcer. Sac syringing was done to assess the state of the lacrimal outflow pathway.

Laboratory investigations included blood for Complete Blood Count and Fasting Blood Sugar to assess the diabetic status.

Corneal ulcer scrapings were taken after local anaesthesia with 1%proparacaine and samples were subjected to Gram's stain 10%, KOH mount and culture and sensitivity for bacterial or fungal organism in blood agar, McConkey medium and Sabouraud dextrose agar.

After the clinical examination was over, the eye was washed with sterile normal saline. Treatment was begun with moxifloxacin0.5% eye drops or fortified antibiotics like cephazoline and tobramycin instilled hourly for 24-48 hours. Systemic antibiotics were used however if the cornea perforated or if there was extension to sclera.

The antibiotic/antifungal frequency was tapered and commercial concentrations resumed as the infection was controlled. When the ulcer progressed despite continuing treatment atypical bacteria, herpes, protozoa or other factors such as dry eyes were suspected. A favorable clinical response was indicated by a decrease in the density of cellular in filtrates, decrease in corneal oedema, epithelial healing over the ulcer bed, a decrease in anterior chamber reaction and ease of pupillary dilatation.

Debridement of the ulcer bed was carried out several times as the debris hinders the drug penetration. In cases associated with chronic dacryocystitis, dacryocystectomy was done.

All the patients were followed up till complete healing of the ulcer or till surgical procedure was done.

3. Results

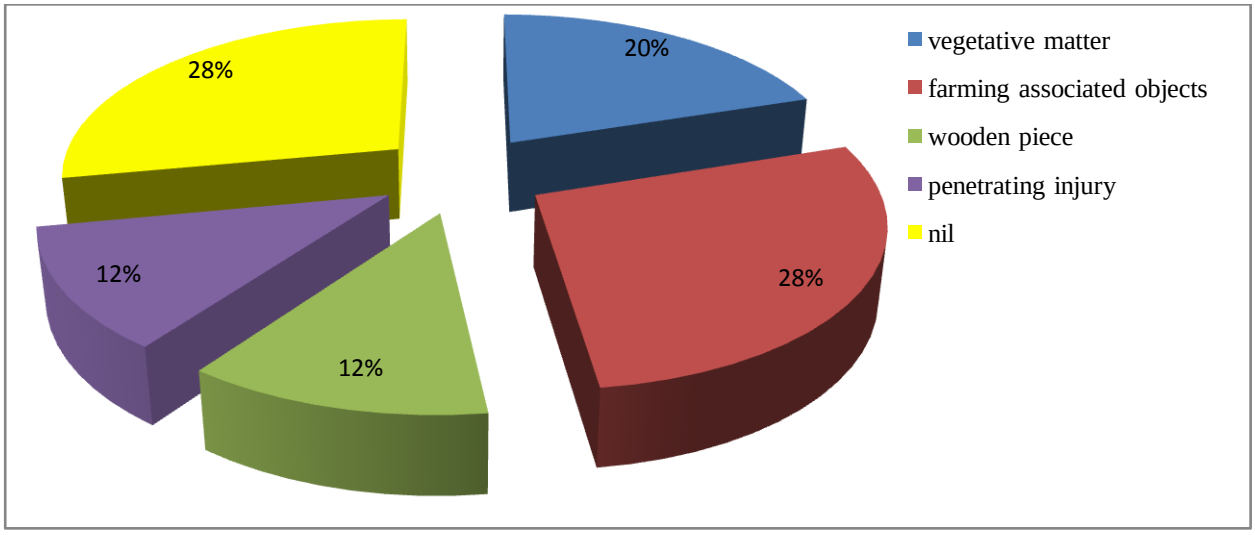
This study was conducted on 100 patients with suppurative keratitis. Sex incidence was 60% male and 40% female. In the present study, we grouped the cases into four groups depending upon the age with 20 year intervals. The incidence of suppurative keratitis was more between the ages of 20 to 60 years, i.e., working age.

Table 1: Age Distribution

Sl. No	Age group in years	No. of cases
1	< 20	6
2	20-40	22
3	40-60	58
4	>60	14

Trauma contributed to 72% of corneal ulcer. Out of the 100 cases, 72% gave history of injury of which 28% had injury with farming associated objects, 20% had injury with vegetative matter and 12% had penetrating injury, 12% gave history of injury with wooden piece, while the remaining 28% did not have any history of injury.

Figure 1: Nature of Injury



50% of the patients gave history of application of some ointment or drops, either prescribed by a local doctor or self medicaments. Of these 40 patients had used antibiotics or antifungals, 6 patients had used antibiotics with steroid preparation and 4 patients had applied native medicines.

Table 2: Previous Topical Treatment

Previous topical treatment	No. of cases	Percentage
Antibiotics/antifungals	40	40
Antibiotics+steroids	6	6
Native medicines	4	4
Nil	50	50
Total	100	

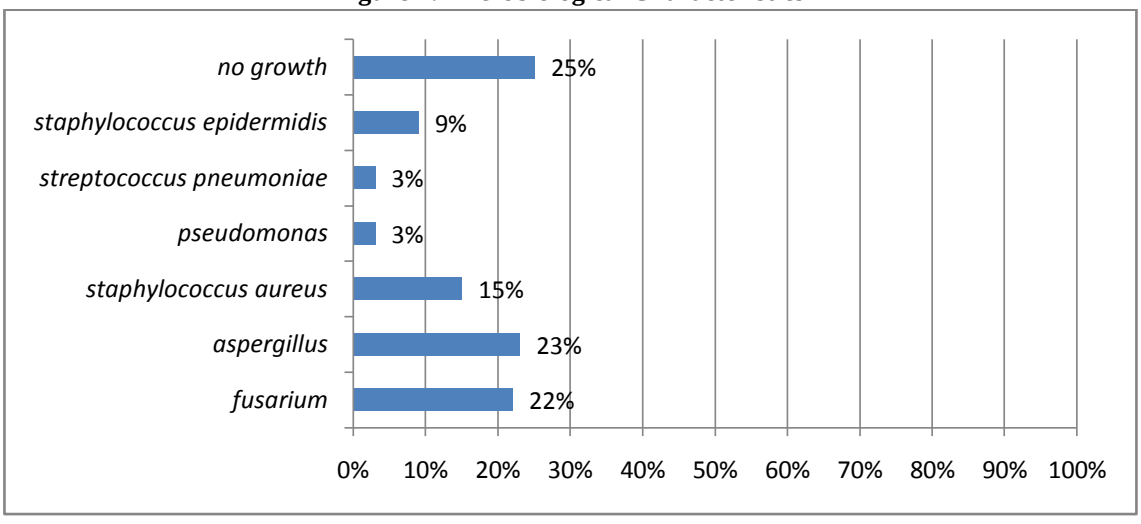
Clinical characteristics were analysed only in confirmed cases of bacterial (30 cases) and fungal (45 cases) keratitis. Time interval between injuries to onset of symptoms was 10-20 days in 62.5% of cases of fungal keratitis and 14.28 % of cases of bacterial keratitis. Features of corneal ulcer were raised dry slough in 81.25% of fungal keratitis cases and yellowish to greyish white purulent slough in 71.42% of bacterial keratitis cases. Satellite lesions were seen in 62.5% of fungal keratitis cases and 14.28% of bacterial keratitis cases. Hypopyon was present in 87.5% of fungal keratitis and 64.29% of bacterial keratitis cases. Visual acuity on presentation ranged from 6/36 to no light perception. Out of 100cases 72 cases (72%) presented with perception of light and hand movements.

Table 3: Analysis of clinical features in fungal and bacterial keratitis

Clinical features	Frequency (% fungal)		Frequency (% bacterial)	
	no	**%**	**no**	**%**
Duration(time of injury to onset of symptoms)				
1-10 days	4/32	12.5	2/28	7.14
10-20 days	20/32	62.5	4/28	14.28
20-30 days	8/32	25	2/28	7.14
Corneal ulcer				
Tenacious raised dry slough	26/32	81.25	8/28	28.57
Yellow to greyish white curdy purulent slough	6/32	18.75	20/28	71.42
Satellite lesions	20/32	62.5	4/28	14.28
Hypopyon				
Present	28/32	87.5	18/28	64.29
nil	4/32	12.5	10/28	35.71

Filamentous fungi accounted for the majority of infection. Aspergillus accounts for 23% of cases while Fusarium make up 22%.*Staphylococcus aureus* forms the main pathogenic bacterial organism (15%). Other bacterial pathogens include *staphylococcus epidermidis* (9%), *streptococcus pneumonia* (3%) and pseudomonas (3%). In 25% of the cases, the culture report came as sterile.

Figure 2: Microbiological Characteristics



All 100 cases were treated with antimicrobial medical therapy. In that 42 Gram stain smear positive cases were treated with commercially available broad spectrum antibiotics. Fluroquinolones 0.3% like ciprofloxacin, ofloxacin, gatifloxacin, moxifloxacin and sparfloxacin were the main drug of choice in our study. Almost 36 cases (85.71%) of bacterial keratitis treated with these eye drops showed favourable response. Fluroquinolones resistant pseudomonas was treated with Tobramycin 0.3% eye drops and subconjunctival injection of Gentamycin 20mg in 0.5ml and 2 case of *S. pneumoniae* treated with fortified cefazolin 50 mg/ml eye drops and sub conjunctiva injection Gentamycin 20mg in 0.5ml. 2 cases positive for *S. aureus* eventually underwent evisceration. Out of 100 cases, 52 cases were KOH

mount positive and 45 were fungal culture positive. Natamycin was considered as drug of choice for all KOH mount positive cases. 33cases (63.46%) cured completely with only Natamycin and 19 cases azoles (Fluconazole2% or Itraconazole) added as second agent. Out of 23Aspergillus culture positive cases 12(52.17%) responded well to Natamycin and out of 22 Fusarium culture positive cases 20 (90.90%) responded well to Natamycin. Two Aspergillus culture positive underwent evisceration.

In our study, 16 persons had chronic dacryocystitis, 6 females (15 %) and 10males (16.6%) all of whom underwent sac excision.

However out of 100 cases 8 patients required surgical management. 2 patients underwent therapeutic penetrating keratoplastyand6cases eventually required eviscereation.

The predominant outcome was a corneal scar with or without vascularisation (45(90%) of 50 followed cases). Of the 100 cases of suppurative keratitis studied in this series, 16 cases ended up with nebular and 58 cases with macular and 16 cases with leucomatous opacity with vascularisation. Complications of suppurative keratitis were noted in10 patients (10%). Two cases ended up in perforation and underwent therapeutic penetrating keratoplasty. 6 cases ended up in panophthalmitis and 2 cases in anterior staphyloma.

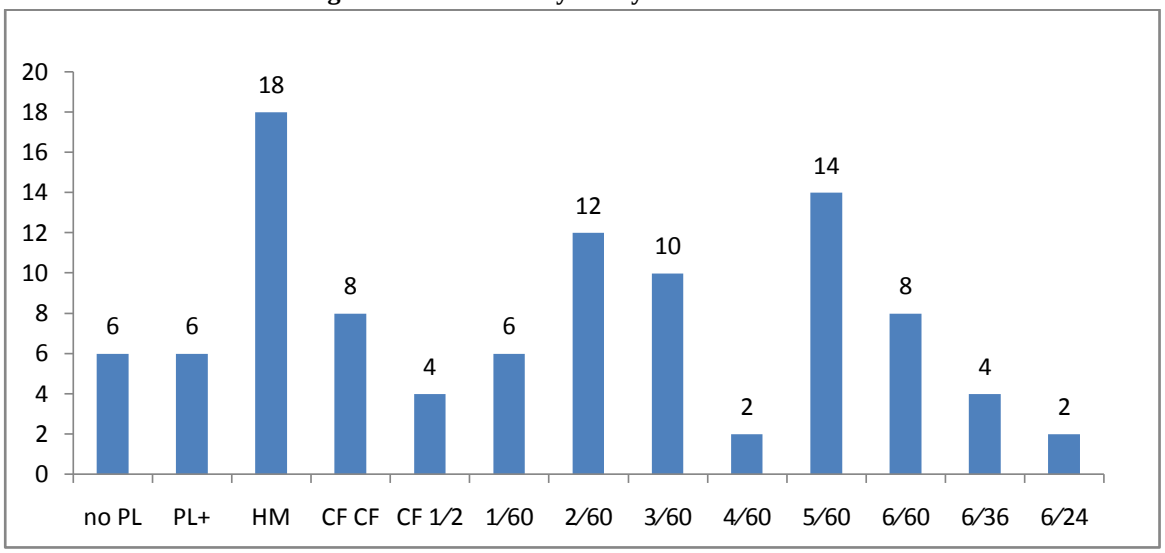
Out of the 6 panophthalmitis cases, 2 were positive for Aspergillus, 2 for *Staphylococcus aureus* and 2 had no growth. All 6 cases underwent evisceration.

Table 4: Complications and Sequelae of Suppurative Keratitis

End result	No. of cases	Percentage
nebula	16	16%
macula	58	58%
leucoma	16	16%
Perforation and pseudocornea	2	2%
panophthalmitis	6	6%
Anterior staphyloma	2	2%

Residual visual acuity after treatment ranged from no perception of light to 6/24.

Figure 3: Visual Acuity Analysis after Treatment



4. Discussion

Corneal ulceration especially when occurring centrally causes significant impairment of vision. In this study incidence of microbial keratitis was higher in males (60%) than females. Both sexes tend to develop corneal ulcers in the middle decade of life when presumably they are more physically active and at a higher risk of corneal injuries. In this study majority of patients were agricultural workers (50%). Out of 100 cases, history of trauma was present in 72% of cases. Undoubtedly ocular injury with vegetable matter, dust and stone contributed to 48% of cases of trauma. Apart from trauma, chronic dacrocystitis was the most common risk factor. Many of the patients presented late for medical attention in our study and this maybe because of illiteracy, ignorance or poverty.50% of the patients in our study had started topical medication before their initial medical examination. Out of 100 cases, 40%werestarted on topical antibiotics or antifungals, 6% on antibiotic with steroids and 4% on some native medication like breast milk, butter or plant extract. All these figures were similar to the studies by Srinivasan M *et al* [1] and Basak K Samar *et al* [2].

In our study the common clinical characteristics of fungal corneal ulcer were long duration of history, dry and raised necrotic slough (81%) and satellite lesions (63%). The features of bacterial keratitis were short duration of history and greyish white with curdy purulent slough (71%). This is similar to the study by Thomas *et al* [3].

Hypopyon was more frequently observed in fungal (88%) than in bacterial (64.29%) keratitis unlike in the study by Thomas *et al* [3] where hypopyon was more frequently observed in bacterial than fungal ulcers.

In this study 75 (75%) cases of corneal scrapings were culture positive. Fungus (45%) accounts for majority of infection. This is mainly because of the area served by our hospital, generally visited by poor agricultural workers and labourers who were injured predominantly with organic matter such as paddy stalk, vegetable matter or dust.

Fusarium (22%) and Aspergillus (23%) were cultured. This figure is less than the South Indian reports by Srinivasan *et al* [1] (51.9%), Leck *et al* [4] (44.1%), Bharathi *et al* [5] and Basak *et al* [2](59.3%). Aspergillus was predominant in South Indian reports by Bharathi *et al* [5] while Fusarium was predominant in South Indian reports by Leck *et al* [4].

In this study 30 cases (30%) were bacteria culture positive. This reduction in bacterial corneal ulcer might be attributed to more successful treatment of bacterial corneal ulcers in periphery since the introduction of topical fluroquinolones. Of the 30 cases 27% were gram positive cocci. In that 15% was *Staphylococcus aureus* which was similar to the eastern India study from Bengal [2] and unlike the south India study [1] in which most common infecting bacteria was streptococcus pneumonia.

Commercially available fluroquinolones were the main drug of choice in (85.71%) bacterial infection. Leibowitz [6], in a multicentere study of patients with culture positive infective keratitis observed 92% success with ciprofloxacin. Similarly Wilhemus *et al* [7] found that clinical success occurred in 93% of patient treated with ciprofloxacin. Gangopadhyaya Nibaran *et al* [8] in their study shown that monotherapy with fluoroquinolone eye drops for treatment of bacterial corneal ulcers led to shorter duration of intensive therapy and shorter hospital stay compared with combined fortified therapy (Cefazolin- Tobramycin).

Fluroquinolone resistant cases like pseudomonas were treated with aminoglycosides (Tobramycin 0.3% eye drops) and *S. pneumoniae* resistant case was treated with fortified Cefazolin 50mg/ml.

The acute management of a bacterial corneal ulcer requires urgent access to appropriate therapy. In addition the cost and toxicity of therapy must be considered.

Clearly in terms of accessibility, cost and toxicity the advantage belongs to fluroquinolone. Moreover they are readily available. The use of fluroquinolones as monotherapy for bacterial keartitis has proved as effective as combined fortified antibiotics. However continued use of antibiotic raises the issues of emerging resistance.

63.46% of fungal keratitis cases were cured completely with only Natamycin 0.5% eye drops. However in 30.76% of cases azoles were added as a second agent.

90.90% of Fusarium and 52.17% aspergillus species culture positive fungal keratitis responded well to Natamycin 0.5% eye drops. This is similar to study done by Jones DB *et al* [9].

However the choice of initial therapy for suspected suppurative keratitis should be guided by contemporary epidemiological findings. Suppurative keratitis remains a therapeutic challenge and a vision threatening ocular condition. Even though the outcome of suppurative keratitis may not be as favourable as regard to vision, less complication and more favourable outcomes are seen in this study.

5. Conclusion

Suppurative keratitis most often occurs after a superficial corneal trauma with vegetative or organic materials. Fungal ulcers are more common than bacterial ulcers. 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 with in 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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