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A Prospective Clinical Assessment Study of Suppurative Keratitis

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ABSTRACT

50 cases of suppurative keratitis were studied. Males were predominantly affected (64%). Incidence of suppurative keratitis is more after the age of 30 years and less after the age of 60 years. 52% of the cases belonged to agricultural workers of low socioeconomic group. 50% of the patients had used antibiotics or antifungal prior to admission. Trauma contributed to 76% of corneal ulcer. 44% of the ulcers were of moderate severity. 14% of the cases had chronic dacryocystitis. Common clinical characteristics of fungal keratitis were long duration of onset of symptoms, dry with raised slough ulcer in 81.2% of cases, satellite lesions in 62.5% of cases and hypopyon in 87.5% of cases. Common clinical characteristics of bacterial keratitis were short duration of onset of symptoms, greyish white with curdy purulent slough in 71.4% of cases, 64.28% cases presented with hypopyon. Fungus was the most common cause for suppurative keratitis (32%) 18% fusarium and 14% aspergillus, were grown on culture. Staphylococcus aureus forms the main bacterial pathogen (16%), Pseudomonas, Streptococcus pneumonia, staphylococcus epidermidis being the second (8%). 5% natamycin was the most commonly employed antifungal drug (63.16%). Commercially available fluoroquinolones (0.3%) were the main drug of choice for bacterial infection. 54% of the cases ended in macular opacity. Central corneal ulcers resulted in gross loss of visual acuity. 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.

INTRODUCTION

In India, there are about 12 million blind people[1]. The incidence of corneal blindness is 15.4%, the corneal ulcer contributing 9.34%, corneal dystrophy 0.49% keratomalacia 1.68%, corneal opacity 3.67% and others like keratoconus 0.09% of this. 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[2]. The commonest cause of corneal blindness is infection made worse by malnutrition due to poverty and ignorance. Suppurative corneal ulcer may be caused by bacteria, fungi and protozoa. Bacterial and fungal infections of the cornea are the major causes of blindness in developing countries like India. Corneal ulceration can progress rapidly, threatening the integrity of the eye and producing significant tissue destruction[3]. Although a few bacteria namely Neisseria gonorrhoeae, Neisseria meningitidis, and Corynebacterium diphtheriae can invade an intact cornea, most pathogens require a break in the epithelial barrier to gain entry and adhere. Bacterial keratitis begins with the adhesion of bacteria to the damaged epithelium and stroma[4]. This epithelial barrier is easily breached by trauma which may range from a minor one with dust particles or small metallic foreign bodies to injury with vegetable matter, stone or wooden piece. Trauma may breakdown the normal defence mechanism and allow the resident flora of the conjunctiva or those from the infected lacrimal sac to colonize the damaged corneal tissue or the pathogenic organisms are inoculated into the eye at the time of injury[5]. Fungal keratitis is common in men above the age of 30 years because they contribute significantly to the agricultural force of the country and are commonly injured with plant and other organic material. Acanthamoeba keratitis is common in patient who expose to contaminated water and improper use of contact lens saline solution[6]. Corneal ulcers of severe degree result in hypopyon. The severity of the ulceration is dependent upon-the virulence of the organism, the integrity of the host defence mechanisms and promptness of appropriate medical attention[7]. The microbial causes of suppurative keratitis vary among geographical locations according to local climate and occupational risk factors. So it's essential to determine local aetiology within a given region when planning corneal ulcer management strategy[8]. Ulcerative keratitis must be considered an urgent problem. Early recognition with prompt working up and rapid institution of appropriate therapy will 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 favourable, still few eyes are lost due to perforation or panophthalmitis and infection with fungus. Severe fungal keratitis on presentation and inadequate response to current anti-fungals, which are fungi static is a major cause for poor response to fungal keratitis[9,10]. The present study is undertaken to evaluate the current concepts of the aetiology, clinical characteristics, pathogenesis, micro biologic 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:

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

MATERIALS AND METHODS

Source of data for this clinical study of suppurative keratitis was patients attending Outpatient Department of Ophthalmology. The study was conducted after obtaining approval from institutional ethical committee and informed written consent was taken from each patient prior to inclusion in the study. 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 history was taken with special reference to history of injury with dust, stone, vegetable matter or penetrating injury, treatment H/o of antibiotics/antifungal, steroids and native medicines, like plant alkaloids, milk, butter etc. was elicited. All patients were enquired about watering from the eye before the present illness and any swelling in the medial canthus. This was stressed to know the presence of chronic dacryocystitis. 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% flourescein 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, McConkey medium and sabouroud dextrose agar. In cases associated with chronic dacryocystitis, DCT was done. After the clinical examination was over, the eye was washed with sterile normal saline. Treatment was begun with atropine 1% eye ointment/eye drops and a broad spectrum antibiotic like Fluroquinolones 0.35% eye drops instilled every 30 minutes. Increased frequency of administration of antibiotic eye drops helps to achieve higher corneal levels of antibiotics. Antibiotic ointments were also used to treat bacterial corneal ulcers but once applied ointments retard subsequent penetration of eye drops hence it was used only at nights. In severe bacterial corneal infections, sub conjunctival or anterior sub-Tenon's injections were given. Injections were administered at 24 hours intervals. A sub conjunctival injection leaves a hole or rent in the conjunctiva through which the drug may leave decreasing the bolus and increasing the drug concentration in the tears. Systemic antibiotics/anti fungal as a rule were not employed routinely for the treatment of a non-perforating corneal ulcer because bacteria have never been demonstrated intra ocularly before a corneal perforation. Systemic antibiotics were indicated however, if the cornea perforates, if there was extension to sclera, if Neisseria gonorrhea was the pathogen or if pseudomonas or haemophiles influenzas was present in infants in which instances systemic spread of the infection may occur. 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. Adjunct therapy with acetazolamide, vitamin C and A were also instituted without delay. A favorable clinical response was indicated by a decrease in the density of cellular infiltrates, 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. When the ulcer progressed, cauterization of the ulcer was done using pure carbolic acid. In cases of massive hypopyon paracentesis 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.

RESULTS AND DISCUSSIONS

Among the 50 cases studied, 32 were male and 18 were female. Sex distribution was 64% male and 36% female. In the present study, we grouped the cases into seven groups depending upon the age with every 10 years gap. Incidence according to age distribution is as follows: Occupation of the patient has definite relationship with the incidence of injury to the eye. Out of 50 cases 52% were agriculture workers and 2% were students. This analysis exhibits that suppurative keratitis was more common in rural population whose occupation was agriculture. Injury is more common in agricultural workers (26 cases). Occupation of patients showed statistically significant association with nature of injury. In our study, 7 persons had chronic dacryocystitis, 2 females (28.5%) and 5 males (71.45%). All underwent dacryocystectomy.

Table 1 :Distribution of Cases According to Previous Topical Treatment

S. no	Previous topical treatment	No. of cases	Percentage
1	Antibiotics /antifungals	21	42
2	Antibiotics + steroids	1	2
3	Native medicines	3	6
4	Nil	25	50
5	Total	50	100

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

Table 2 : Analysis of Clinical Features in Fungal and Bacterial Keratitis

S. no	Clinical features	Frequency (% fungal)		Frequency (% bacterial)	
		No.(n=16)	%	No.(n=14)	%
1	Duration: (Time of injury to onset of symptoms)				
	1-10 days	2	12.5	11	78.5
	10-20 days	10	62.5	1	7.1
	20-30 days	4	25	2	14.2
2	Corneal ulcer: Tenacious, raised dry slough	13	81.2	4	28.5
	Yellow to grayish white, curdy purulent	3	18.7	10	71.4
	Slough Satellite lesions	10	62.5	4	28.5
3	Hypopyon:				
	Present	14	87.5	9	64.28
	Nil	2	12.5	5	35.71
4	Stage of corneal ulcer:				
	Mild	3	18.75	8	57.14
	Moderate	9	56.25	5	35.71
	Severe	4	25	1	7.14

Time internal 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 grayish white purulent slough in 71.4% of bacterial keratitis cases. Satellite lesions seen in 62.5% of fungal keratitis cases. In our study, out of 50 cases 42% of cases fell into the moderate group, while 14% of cases were of severe category.

Table 3: Microbiological Characteristics of Study Subjects

S. no	Micro-organism	No of cases	Percentage
1	Fusarium	9	18
2	Aspergillus	7	14
3	Staphylococcus aureus	8	16
4	Pseudomonas	2	4
5	Streptococcus pneumonia	2	4
6	Staphylococcus epidermidis	2	4
7	No growth	20	40
8	Total	50	100

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. All 50 cases were treated with antimicrobial medical therapy. In that 21 Gram stain smear positive cases 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 18 cases (85.71%) of bacterial keratitis treated with these eye drops showed favorable response. 1 case of Fluroquinolone resistant pseudomonas was treated with Tobramycin 0.3% eye drops and sub conjunctival injection of Gentamycin 20mg in 0.5ml and 1 case of S. pneumoniae treated with fortified cefazolin 50 mg/ml eye drops and sub conjunctival injection Gentamycin 20mg in 0.5ml. 1 case of S.aureus eventually underwent evisceration. 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 postive 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. The predominant outcome was a corneal scar with or without vascularization (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 vascularization. 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. 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.

Infectious keratitis is one of the major causes of avoidable blindness. It is the second most common cause of monocular blindness, after un operated cataract. Corneal ulcer when occurring centrally causes significant impairment of vision. Bacterial keratitis rarely occurs in the normal eye because of human cornea's natural resistance to infection. However, predisposing factors such as corneal injury, contact lens wear, ocular adnexal dysfunction (including tear deficiencies), corneal abnormalities and systemic diseases may alter the defence mechanisms and permit bacterial invasion. Fungal keratitis is very common especially in tropical climates, like India. Its incidence decreases in temperate climates and in high altitudes. A large proportion of these infections occurs following trauma especially with vegetative matter. The present study included 50 cases of clinically diagnosed bacterial and fungal keratitis. In this study incidence of microbial keratitis was higher in males (64%) than females. Considering the predominant predisposing factor of trauma in both bacterial and fungal keratitis, the probable reason for male preponderance is obvious. In the present study the incidence of suppurative keratitis was more between the age of 31-60 years, among 50 patients of our study 37 patients (74%) are in that group i.e., working age. 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 the present study the incidence of suppurative keratitis was more in agricultural workers. Among 50 patients of our study 26 patients (52%). In our study of 50 patients 38 patients (76%) came with the history of corneal trauma. Apart from trauma chronic dacryocystitis was most common risk factor. Trauma may break down the normal defence mechanism and allow the resident flora of the conjunctiva or those from the infected lacrimal sac to colonize the damaged corneal tissue or pathogenic organisms are inoculated into the eye at the time of injury. The tissues of the host vary in their ability to withstand infection. Mutilated and necrotic tissues poor blood supply, weak immunologic responses, the presence of foreign bodies

(dust) all increase the chances of infection. Nature of injury also accounts for the severity of infection and inflammation. Out of the 50 cases, 38 patients (76%) gave history of injury of which 28% had injury with objects like stone, metal piece, insect, ash powder dust and cow tail. 24% was injury with vegetable matter and 12% had penetrating injury, 12% gave history of injury with wooden piece, while the remaining 24% did not give any history of injury. The agents responsible for trauma were mainly organic materials to which farmers are exposed including paddy stalk, plant twigs, grass, dust and animal products. Labour engaged in small scale industries and factories were injured by the industrial implements, metal particles or other items. In our study occupation of patients showed statistically significant association with nature of injury(x^2 =40.36,p valve=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 (x2=9.129,p value=0.058). 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. Of 50 cases 42% on topical antibiotic or anti fungal, 2% on steroid and 6% on some native medication like breast milk, butter or plant extract. But in our study we have not focused on the duration of initiation of treatment after injury as patients attending our hospital are mostly illiterates. In our study common clinical characteristics of Bacterial keratitis were short duration of history, grayish white with curdy purulent slough in 71.4% cases. Microbiological investigations should be performed whenever possible., however, where facilities are not available, a rapid presumptive diagnosis of suppurative keratitis may be possible by clinical findings. 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%). This is mainly because of the area served by our hospital generally visited by poor agricultural workers and labours who were injured predominantly with organic matter such as paddy stalk, vegetable matter or dust. This reduction in bacterial corneal ulcer might be attributed to more successful treatment of bacterial corneal ulcers in periphery since the introduction of topical fluoroquinolones. 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, 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. In fungal group, 32 (47.0%) were identified as Aspergillus species. Candida species and Fusarium species were less commonly seen. Bacterial and fungal infections occur in equal numbers with Streptococcus pneumoniae accounting for the majority of bacterial ulcers and Fusarium spp responsible for most of the fungal infections. Fungal ulcers are more common than bacterial ulcers. Aspergillus spp and Staphylococcus aureus were the most common fungus and bacteria respectively. 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 favorable response. 1 case of Fluroquinolones resistant pseudomonas was treated with Tobramycin 0.3% eye drops and sub conjuctival injection of Gentamycin 20mg in 0.5ml and 1 case of S. pneumoniae treated with fortified cefazolin 50 mg/ml eyedrops and sub conjunctival injection Gentamycin 20mg in 0.5ml. 1 case of S.aureaus eventually underwent evisceration. 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 positive underwent evisceration. Commercially available fluroquinolones 0.3% were the main drug of choice in bacterial infection where in fluroquinolones resistance cases like pseudomonas were treated with aminoglycosides (Tobramycin 0.3% eye drops) and S.pneumoniae resistant case was treated with fortified cefazolin 50mg/ml. In a study focused on the efficacy and safety of topical 0.3% ciprofloxacin hydrochloride ophthalmic ointment in the treatment of bacterial keratitis concluded that Ciprofloxacin ophthalmic ointment is an effective and safe topical antimicrobial agent for the treatment of bacterial keratitis caused by susceptible microorganisms. In our study 63.16% of fungal keratitis cases cured completely with only Natamycin 0.5% eye drops. However in 31.58% of cases azoles added as second agent. 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 our study. 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. In our study group of 50 patients we did conjunctival hooding in 2 cases of impending perforation Although tissue adhesive and bandage contact lens is the better option in cases of impending perforation and corneal thinning which give tectonic support, in our study we have not used because of non availability. In our study the predominant outcome was a corneal scar with or without vascularization (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 vascularization. Complications of suppurative keratitis were noted in 5 patients (10%). 1 case which ended in perforation, underwent therapeutic penetrating keratoplasty, 3 cases lead to panophthalmitis and 1 case resulted in anterior staphyloma. Out of 3 panophthalmitis cases 1 was positive for aspergillus, 1 was for S. aureus on culture and 1 had no growth. All 3 cases which did not respond to the treatment underwent evisceration. In our study, out of 47 cases, opacities of 32 cases were central, 15 cases were peripheral and 3 cases underwent evisceration. Site of the corneal ulcer, surface of the infiltrate and depth of extension were the most important factors on residual visual acuity. 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 para central and peripheral corneal ulcers visual acuity was as good as 6/60- 6/36. lens wear is the most important risk factor. Most community acquired bacterial ulcers resolve with appropriate treatment. The above study emphasizes that with appropriate treatment the contact lens related corneal ulcer have better visual outcome.

CONCLUSION

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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