Section: Ophthalmology

Original Research Article

PROFILE OF SUPPURATIVE CORNEAL ULCER

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ABSTRACT

Background: Purpose: To analyze the prevalence of bacterial and fungal corneal ulcer among diagnosed cases of suppurative corneal ulcer and to compare the role of direct microscopy and culture results in etiological diagnosis of suppurative corneal ulcer.

Materials and Methods: A total of 31 patients with clinically diagnosed cases of suppurative corneal ulcer of all ages and either sex, who presented during a period of one year were studied. A detailed history and ocular examination was performed on each patient. All these corneal ulcers were scraped for direct microscopy and culture.

Results: In this study 19 cases (61.3 %) were culture positive. In 15 cases (48.4%) pure bacterial growth was observed, in 3 cases (9.7%) pure fungal growth was observed. In one case both bacterial & fungal growth was observed. The most common bacterial isolate detected was Staphylococcus aureus. Most common fungal isolate detected was Acremonium species. Analysis of KOH wet-mount and Gram-stained smear was done using culture as gold-standard, sensitivity and specificity of KOH wet mount was 25% and 92.6% respectively. Sensitivity and specificity of Gram stain smear was 33.3 % and 95.5 % respectively.

Conclusion: We conclude that suppurative corneal ulcer is a major cause of preventable monocular blindness and educational strategies can reduce avoidable risk such as trauma, but treatment protocols are required to manage established disease

Keywords: Corneal ulcer, hypopyon, bacterial, fungal, stromal, conjunctival, microscopy, culture.

INTRODUCTION

Corneal ulceration is defined as loss of corneal epithelium with under lying stromal infiltration & suppuration associated with signs of inflammation with or without hypopyon.[1] Most of the cases of corneal ulceration results in corneal scarring and partial and total loss of vision. Central corneal ulceration has high significance, since scarring in that location results in marked visual loss leading to uniocular corneal blindness, even if the infection is successfully controlled.[2] Corneal blindness patients are usually younger compared to those suffering from cataract. Hence the impact of corneal blindness (i.e., total blind years) is greater.[3] Fungi gain access into the corneal stroma through a defect in epithelium, then multiply and cause tissue necrosis and an inflammatory reaction. The epithelial defect usually results from trauma. The organisms can penetrate an intact descemet membrane and gain access in to the anterior chamber or the posterior segment. Mycotoxins and proteolytic enzymes augment the tissue damage.[4]

MATERIALS AND METHODS

A total of thirty one cases of suppurative corneal ulcer were studied. Patients with suspected or confirmed viral keratitis, healing corneal ulcers, neuroparalytic keratitis, interstitial keratitis, ulcers associated with autoimmune conditions, cornea at risk of perforation, small ulcers (less than 2mm size) and patients who refused to participate were excluded from the study. Patients were examined using standardized protocol and performa. A detailed ocular examination was performed. The presence or absence of features like elevation of slough [raised or flat], texture of slough [wet or dry], ulceration margin [serrated or well defined], satellite lesions, immune ring, hypopyon,

keratic precipitates. fibrinous exudates, flare or cells in anterior chamber, deep lesions [posterior corneal abscess or endothelial plaque], associated ocular conditions such as blepharitis, trichiasis, dacryocystitis, dry eyes and corneal anesthesia etc. were noted. Patients were followed up on first day, second day, seventh day, fourteenth, and thirtieth day or after from the day of initial presentation .To determine the causative organism. corneal scrapings were taken under magnification of slit lamp biomicroscope for direct microcopy and culture. After topical anesthesia with xylocaine 4%, the base and the leading edges of the ulcers were scraped from periphery to centre with the blunt edge of 15 No. disposable blade. The material was smeared on three slides i.e. wet mount KOH 10%, Gram staining and Giemsa staining. It was smeared thinly with a marked area on the glass slides for Gram staining and Giemsa staining. For KOH 10% preparation, scrapings were placed within a marked area on glass slide and then covered with one drop of KOH 10%, followed by placement of cover slip. The material was then inoculated on to blood agar, chocolate agar, Sabouraud's dextrose agar in c-shaped streaks, and also was inoculated into Brain heart infusion broth followed by sub culture on solid medium. One separate swab from conjunctival sac of uninvolved eye for culture, was taken after moistening the swab stick with normal saline from a freshly opened bottle for correlation between the normal flora of uninvolved eye and causative organism of involved eye. All inoculated culture media were incubated aerobically at 250 C and 370 C for fungi and bacterial growth respectively. The inoculated Sabouraud's dextrose agar was examined daily, and discarded at three weeks if no growth is seen. If fungal hyphae be observed on corneal scrape smear, but failed to grow in culture, the causative organism was reported as fungal.[5]

RESULTS

A total of 31 patients met the inclusion criteria of this study. Sixteen (51.6%) patients were male & fifteen (48.4%) were female. Twenty six (83.9%) patients were treated as indoor patients and five (16.1%) patients were treated as outdoor patients. Mean duration of indoor treatment was 15.42 days (range 3-29 days). All thirty one (100%) patients were from rural background. Maximum number of cases were illiterate (twelve cases: 38.7%) and under matric (eleven cases: 35.5%). There were three ITI technicians among thirty one cases. Most common age group was between 41-60 years (38.7%) and the mean age was 54.9 years (range 22 to 95 years). Most of the patients (67.7%) had consulted healthcare providers of some kind before presenting to this referral rural centre and had used topical medications like antibiotics, antifungal, steroids and traditional medicines like ayurvedic eye drops, plant juice etc. A significant increase in number of cases was observed during harvesting seasons of March-April (11 cases: 35.4%) & November-December (8 cases:25.8%). Majority of the cases of suppurative corneal ulcer were agricultural workers (18 cases: 58.1%). Corneal injury was the most common (21 cases: 67.7%) predisposing factor in causing suppurative corneal ulcer. Among these 21 cases, injury with vegetative matter was the most common traumatic agent. Eight cases were associated with hypo secretion of basic tearing (<10 mm wetting of Whatman filter paper strip) which shows that dry eye predisposes to suppurative corneal ulceration. In this study 19 cases (61.3 %) were culture positive. In 15 cases (48.4%) pure bacterial growth was observed, in 3 cases (9.7%) pure fungal growth was observed. In one case both bacterial & fungal growth was observed. The most common bacterial isolate detected was Staphylococcus aureus. Most common fungal isolate detected was Acremonium species. Analysis of KOH wet-mount and Gram-stained smear was done using culture as gold-standard, sensitivity and specificity of KOH wet mount was 25% and 92.6% respectively. Sensitivity and specificity of Gram stain smear was 33.3 % and 95.5 % respectively. Of the 31 conjunctival swabs taken from uninvolved eye, thirteen (41.9%) were culture positive. In 3 cases micro-organism detected as pathogen in the involved eye was same as detected in the normal flora of uninvolved eye, which shows that normal commensals of conjunctiva are often encountered as agents of corneal ulcer.

Table 1: Occupation wise distribution of subjects. n=31

Occupation	Agriculturists	House wives	Labourers	Mechanics	Driver	Others
No. Of cases	18	4	3	3	1	2

Maximum number of patients (58.1%) were agricultural workers.

Table 2: Distribution of subjects according to their predisposing factors. n=31

Predisposing factors	Particulars	No. of cases
Ocular factors	Corneal injury	21 (54.8%)
	Lagophthalmos*	3 (9.6%)
	Chronic dacryocystitis*	2(3.2%)
	Trichiasis	2 (6.4%)
	Use of topical steroids	3 (9.6%)
	Ectropion	1 (3.2%)
Systemic factors	Diabetes mellitus*	2 (6.4%)

NONE		3(9.3%)

Note:* Some patients had more than one predisposing factors

Table 3: Distribution of subjects according to traumatic agents.n=21

Traumatic agents	Vegetative matter	Dust	Stone	Wooden stick	Metal	Tooth brush
No. of cases	13	3	2	1	1	1

Note: 1. Injury with vegetative matter (61.9%) was the most common
2. An unusual mode of injury with toothbrush was noticed during this study.

Table 4: Comparision of BCVA of subjects in involved eye on day of presentation and on final follow up.n=31

Suppurative corneal ulcer	BCVA on day of presentation	BCVA on final follow up
Better than 6/18	4	7
6/18 to 3/60	5	7
Worse than 3/60	22	17
Total	31	31

Table 5: Distribution of subjects according to bacterial isolates detected from culture.n=16

Bacteria	Pure isolates	Mixed with fungi	Total (%)
Gram positive organisms isolated			
Staphylococcus aureus	3	1	4
Coagulase negative Staphylococcus	2		2
Streptococcus pneumoniae	2		2
Streptococcus viridans	1		1
Streptococcus species	1		1
Diptheroids	1		1
Subtotal	10	1	11
Gram negative organisms isolated			
Moraxella lacunata	1		1
Pseudomonas aeruginosa	1		1
Other Non fermenting group of organisms	3		3
Subtotal	5		5
Total	15	1	16

Table 6: Distribution of subjects according to fungal isolates detected from culture. n=4

Fungi	Pure isolates	Mixed with bacteria	Total
Acremonium species	2		2
Aspergillus flavus		1	1
Fusarium species	1		1
Total	3	1	4

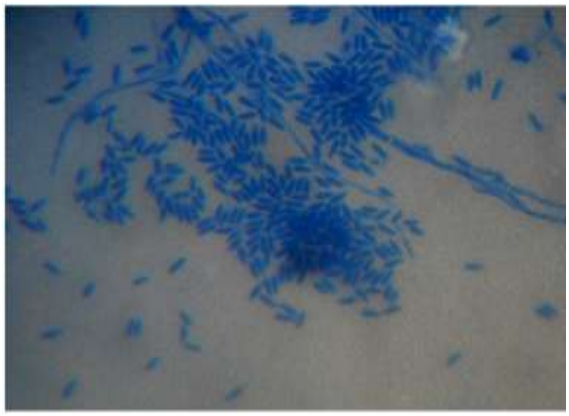

Figure 1: Photo showing conidia of Acremonium species

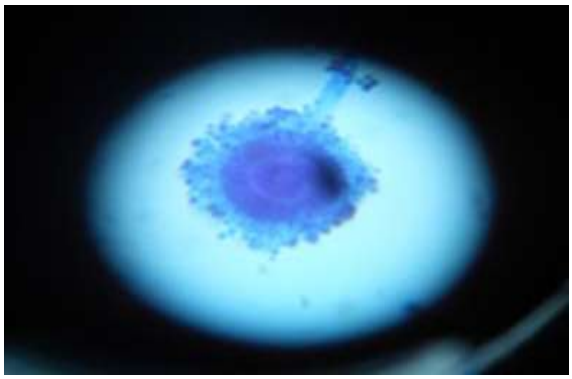

Figure 2: Photo showing conidia of Aspergillus species

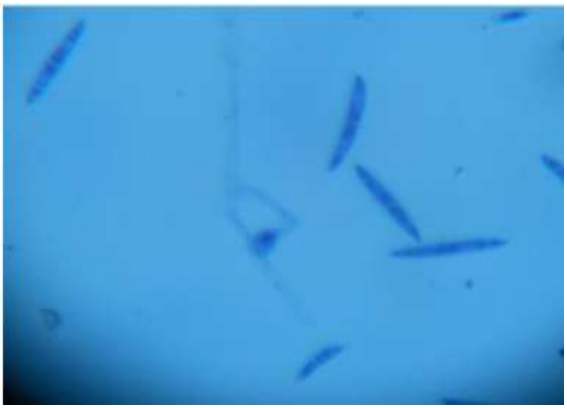

Figure 3: Photo showing conidia of Fusarium species

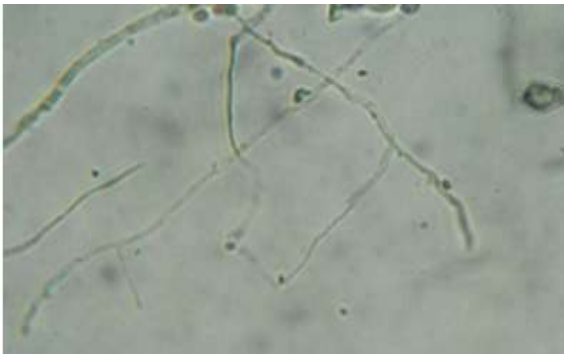

Figure 4: Photo showing fungal hyphae in KOH Wetmount

DISCUSSION

Suppurative corneal ulcer continues to be the cause of concern and predominance of agricultural activity is the principal causative factor. Most of these ulcers follow minor agricultural injuries.

In this study all (100%) patients were from rural background. Arya S K et al,[6] in their study in a tertiary level hospital in Chandigarh noticed, that patients from rural background outnumbered urban patients. In this study most common age group was between 41-60 years (38.7%) and the mean age was 54.9 years (range 22 to 95 years). None of the patient was below 20 years old. This is a reflection of the fact that most of the injuries in our study are work related in patients engaged in agricultural activities [Table 1]. Hooi S H et al,[7] in a retrospective study of 100 culture proven bacterial keratitis in a Malaysian general hospital found that peak age range was 41-50 years and mean age was 41.4 years (range 28days to 86 years).

In this study education status of the patients was noted and it was noticed that less educationally qualified people are more prone to corneal ulceration. Gupta N et al,[5] stated that population particularly those belonging to lower socioeconomic status and those who are illiterate with poor knowledge about proper eye care and decreased awareness regarding using preventive measures are prone to develop suppuratve corneal ulcer following trivial trauma.

A significant increase in the number of cases of suppurative corneal ulcer was observed during harvesting season. During these seasons, people are more prone to trivial corneal injuries with vegetative matter like thorn, leaf, branch of plant or tree etc. Bharati MJ et al,[8] in their study in south India also found that incidence of keratitis was higher during the time of year when agriculture activity was greater. In this study the most common predisposing factor causing suppurative corneal ulcerations was corneal injury [Table 2]. Most common traumatic agent was vegetative matter [Table 3]. An unusual mode of injury with tooth brush was noticed. None of the patients gave history of using contact lens. Our observations matched with the study done by Srinivasan M et al,[9] in south India as they reported that history of corneal injury was obtained in 65.4% of the patients of corneal ulcer and agents responsible for trauma were mainly agricultural products. But Schaefer F et al,[10] in their study of 85 consecutive patients of bacterial keratitis in Switzerland identified the most common risk factor as contact lens wear (36%). This can be explained as contact lens use is not common in developing country like India.

In this study, before their first presentation at this rural referral centre twenty one (67.7%) patients have consulted health care providers of some kind and have used topical medications like antibiotic, antifungal, steroids, ayurvedic medications, plant juice etc. Two patients gave history of visit to traditional healers. One of these was prescribed plant juice. The involved eye of other patient was swept with a small wooden rod in fornices and was associated with chanting of mantras (local religious belief). Three patients used steroid eye drops prescribed over the counter by the chemists and by other health providers. Srinivasan M et al,[9] in their study, found that 162 (37.3%) of the total patients were using or had recently used some kind of herbal topical medicines, plant juice, oil and breast milk into the eye, before presentation.

In this study Schimer Test –I of the uninvolved eye of all the patients was done. Eight cases (25.8%), were associated with hypo secretion of basic tearing, which shows that dry eye is the associated risk factor for development of suppurative corneal ulcers. This finding matched with the study done by Hooi SH et al,[7] on 100 cases of culture proven bacterial keratitis they found that 28 cases were associated with ocular surface disease.

A comparative evaluation of BCVA on day of presentation and on final follow up was done [Table 4]. Most of the patients showed improvement in BCVA on the final followup day except those patient who already had decreased vision before development of symptoms or who have developed complications during course of treatment or who have developed central corneal opacity after healing. Therefore central corneal ulcers however small sized these may be, must be treated intensively to prevent profound vision loss that may result subsequently. Sharma S,[11] also stated that corneal opacity resulting from a small ulcer in the centre of the cornea can lead to blindness or loss of eye.

We observed that, Staphylococcus aureus was the most common bacterial isolate detected on culture [Table 5]. Among 4 fungal culture positive cases, Acremonium species was detected in 2 cases, Aspergillus flavus and Fusarium species were detected in one case each [Table 6, Figure 1-3]. Analysis using culture as the gold-standard test revealed sensitivity of 25 % for KOH wet-mount & 33.3 % for Gram-stained smear. Low positivity of direct smear can be attributed to the fact that patients already had a cocktail of antibiotics and antifungals before presentation. Variuos studies done by Abdullah Al-Mujaini et al,[12] Bharathi M J et al,[1] and Arya S K et al,[6] show that the sensitivity of KOH mount to detect fungal hyphae varies widely from 30% to 99%. In our study the sensitivity was 25%. It may be explained by the fact although KOH mount is a very useful method to detect fungal hyphae, but is highly dependent on the examiner and technique of specimen collection and should not be solely relied upon [Figure 4]. Chander J et al,[13] in their five year study in Chandigarh found that, fungal corneal ulcer was more prevalent among males (3:1). We also found that all six cases of fungal keratitis were male. In our study Acremonium species was the commonest fungal isolate detected. Dunlop AAS et al,[14] stated that over 20 years ago, Jones observed that each geographic region has a differing prevalence of corneal pathogens. Verghese S,[15] reported a case of fungal keratits caused by Acremonium recifie in Tamil Nadu.

In the present study conjunctival swabs were taken from uninvolved eye of all patients. The most common isolate detected was Satphyloccocus species and it was found that in three cases micro-organism detected as pathogen in the involved eye was same as detected in the normal flora of uninvolved eye, which shows that normal commensals of conjunctiva are often encountered as agents of corneal ulcer. Panhalkar S et al,[16] studied bacterial profile in healthy controls and revealed that Staphylococcus albus (41%) was the most common organism detected in normal flora.

In our study a treatment protocol was followed. It consisted of fortified cefazoline 5%, fortified tobramycin 1.3%, atropine eye drops 1%, tablet acetazolamide 15mg /kg /day. In fungal corneal ulcers, Natamycin 5% drops were added to the treatment regime. Clinically suspected and non responding cases of fungal corneal ulcer were also given oral Itraconazole 100 mg 12 hourly. Surgical procedures or other interventions were performed in 8 cases (25.8%). Three cases with associated lagophthalmos were operated for lateral tarsorrhaphy, two cases which developed endophthalmitis due to perforation were eviscerated, two cases with descematocele were applied bandage contact lens and two cases associated with chronic dacryocystitis were operated for dacryocystorrhinostomy. Tahereh S et al,[17] stated that despite advances in diagnosis and medical treatment of keratomycosis, 15-27% of patients require surgical intervention such as keratoplasty, enucleation or evisceration because of either failed treatment or advanced disease at presentation.

CONCLUSION

We conclude that suppurative corneal ulcer is a major cause of preventable monocular blindness and educational strategies can reduce avoidable risk such as trauma, but treatment protocols are required to manage established disease.[18,19]

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