Original Article

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Corneal Ulcer: A Case Series Study

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Abstract

Aims and Objectives: To identify the specific pathogenic organisms risk factors responsible for infection in corneal ulcer patient. *Materials and Method:* The present study was undertaken on 200 patients of corneal ulcer attending the outpatient department, with special reference to the etiology and predisposing factors, examination in detail for morphological features, microbiological work up, management and follow up. *Results:* Out of 200 patients, Male:Female ratio was 1.8:1. Most common age group affected was between 31–50 years for all types of infectious keratitis, 45%, 35%, 6% and 14% for bacterial, mycotic, mixed and sterile keratitis respectively. Socio-economically poor classes had 88% of keratitis. Keratitis occurred more frequently in the residents of rural areas 82%. Trauma was found to be the most common predisposing factor accounting for 66.5% followed by chronic dacryocystitis 8.5%. Inferonasal cornea was involved with highest frequency in bacterial and central cornea in fungal keratitis. Staphylococcus epidermidis 37.04% was the most common bacterial isolate followed by staphylococcus aureus 24.07%. Fusarium sp. 33.3% and Aspergillus sp. 33.3% were most common of fungal isolates. *Conclusion:* Central corneal ulceration is a common problem in surroundings of Raichur and most often occurs after a superficial corneal injury with organic material. Bacterial keratitis is marginally higher than fungal keratitis. Staphylococcus epidermidis is most common bacterial and Fusarium spp. And aspergillus spp are the most common fungal isolate.

Kaywords: Corneal Ulcer; Bacterial Keratitis; Mycotic Keratitis; Chronic Dacryocystitis.

Introduction

Corneal ulcer is a loss of the corneal epithelium with underlying stromal infiltration and suppuration associated with signs of inflammation with or without hypopyon [1].

Diseases affecting the cornea are a major cause of blindness worldwide, second only to cataract in overall importance. The epidemiology of corneal blindness is complicated and encompasses a wide variety of infectious and inflammatory eye diseases that cause corneal scarring, which ultimately leads to functional blindness. In addition, the prevalence of corneal disease varies from country to country and even from one population to another. While cataract is responsible for nearly 20 million of the 45 million blind people in the world, the next major cause is trachoma which blinds 4.9 million individuals, mainly as a result of corneal scarring and vascularisation. Ocular trauma and corneal ulceration are significant causes of corneal blindness that are often underreported but may be responsible for 1.5–2.0 million new cases of monocular blindness every year [2-9].

The epidemiological pattern and causative agents for corneal ulcer varies significantly from country to country and even from region to region within the same country. It is important to determine the regional etiology within a given region for comprehensive strategy for the diagnosis and treatment of corneal ulcer. The associated ocular morbidity is the result of several factors and patient's management is directly affected by lack of diagnostic facilities and initiation of appropriate antimicrobial therapy. Specific treatment requires quick and accurate identification of the causative micro organisms. These are crucial if a programme of prevention is to be considered and if appropriate therapeutic measures are to be instituted [10-13].

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Materials and Method

This prospective study was undertaken on 200 patients of corneal ulcer attending the outpatient department, with special reference to the etiology and predisposing factors, examination in detail for morphological features, microbiological work up, management and follow up.

Inclusion criteria included all patients diagnosed with infective corneal ulcer.

Patients with viral ulcers, healing ulcers, mooren's ulcers, marginal ulcers, interstitial keratitis, sterile neurotrophic ulcers, any ulcer associated with autoimmune conditions and if patient was on treatment were excluded from the study.

After selection of patients, standardized proforma was filled for each patient documenting, age, sex, domicile, education, economic status, occupation and predisposing factors including history of trauma, diabetes mellitus & surgeries (if any). Detailed clinical history was taken and any previous usage of medications were recorded.

Clinical procedure

After having obtained a written informed consent,the sampling procedure was undertaken. Detailed systemic clinical examination of patient was done. Visual acuity of every patient was noted. Detailed clinical examinations including slit lamp biomicroscopy with special reference to fluorescein staining was done.

Material was collected from conjunctiva, sac area, corneal ulcer scrapings. Corneal scrapings was performed under aseptic conditions on each ulcer taken after putting topical anaesthesia (4% lignocaine) using a flame sterilized kimura spatula or 15 No. blade. Material from corneal scraping was smeared on to separate glass slides: one for gram stain and other for KOH mount. Material was sent for culture. Material obtained from scraping was inoculated directly onto sheep's blood agar, chocolate agar, Mac Conkey's agar for bacterial culture and sensitivity. Also for fungal culture material was inoculated on to Sabouraud's Dextrose agar. By convention to indicate the site of inoculums on a solid medium, harvested material was inoculated in the form of a 'C' streak on each medium from separate scrapings.

Laboratory procedure

For bacterial culture, the specimens were cultured on dried plates of MacConkey's agar at 37°C for 18-24 hours and on 5% Sheep Blood agar and Chocolate agar with 5-10% CO_2 atmosphere (candle jar) at 37°C for 24-48 hours and the same swab was placed in BHI (Brain Heart Infusion) broth and incubated at 37°C for 18-24 hours. The plates were examined for growth, If there was no growth, the plates were further incubated for up to 7 days to look for any slow growing or fastidious organisms and reported as no growth if no growth even after 7 days of incubation. Presence of growth only on the "C" streak was considered significant then the colony morphology was studied on the Mac Conkey's agar, Blood agar and Chocolate agar plates and processed further. BHI broth was examined for any turbidity and sub cultured on MacConkey's agar at 37°C for 18-24 hours and Blood agar with 5-10% CO_2 atmosphere (candle jar) at 37°C for 24-48 hours were examined for growth, if there was no growth seen then it was reported as no growth. For further identification isolated colony was inoculated on appropriate media for biochemical tests.

For fungal culture, the specimens (one more separate swab) was used to inoculate on Sabouraud's Dextrose Agar tube and incubated at 25°C, it was examined daily for any growth for the first week and twice a week for a period of four weeks. Rate of growth, Morphology of colony, Texture, Surface pigmentation, was observed. Microscopic examination like Lactophenol cotton blue mount and slide culture were done to identify the fungi.

Systemic investigations:

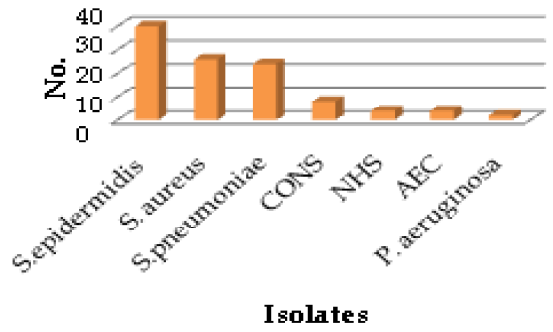
Haemoglobin, Total and Differential leucocyte count, Erythrocyte sedimentation rate, Random blood sugar, HIV testing, Hbs Ag testing, MRI head and brain (optional).

Results

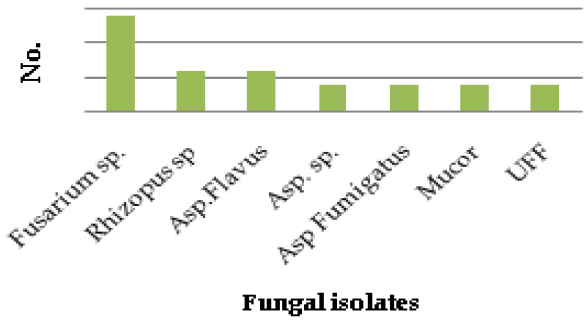
During 12 consecutive months (July 2016 to June 2017), 200 patients were seen with acorneal infiltrate who were compatible with the diagnosis of infective keratitis.

Male: Female ratio for infectious keratitis was 1.8:1. There was no significant difference in the eyes involved. Involvement of Right eye was slightly more (52%) compared to Left eye (48%). In total 90 cases were diagnosed as bacterial keratitis, 70 cases as fungal keratitis and 12 cases as mixed (both bacterial and fungal), no growth was seen in 14 cases and were termed as sterile. The commonest age group was found to be between 31–50 years for all types of infectious keratitis. 45%, 35%, 6% and 14% for bacterial, mycotic, mixed

and sterile keratitis respectively. Staphylococcus epidermidis was the predominant bacterial isolate in 40 cases (37.04%), followed by Staphylococcus aureus 26 cases (24.07%), Streptococcus pneumoniae 24 cases (22.22%), Coagulase negative staphylococci (CONS) in 8 cases (7.41%), Non Hemolytic streptococci (NHS), atypical E Coli in 4 cases (3.70%) each. Pseudomonas aeruginosa was isolated in contact lens user in 2 cases (1.85%).



Graph 1: Bacterial isolates



Graph 2: Fungal isolates

The predominant fungal isolate was Fusarium sp. 28 cases (33.3%) followed by Aspergillus Flavus and Rhizopus sp. 12 cases (14.29%) each. Aspergillus sp., Aspergillus Fumigatus, Mucor isolated in 8 cases (9.52%) each. 8 cases (9.52%) of the isolates remained unidentified all which were filamentous fungi (UFF).

Socio-economically poor classes showed the highest percentage of keratitis i.e 87%. Keratomycosis and bacterial keratitis occurred more frequently in the residents of rural areas 82%. People associated with farm work were most commonly predisposed to the infectious keratitis 76 cases (38%), followed by coolie labours 48 cases (24%)

Trauma was the most common (66.5%) predisposing factor followed by chronic dacryocystitis 8.5%, chronic steroid use 7%, lid disorders 6%, dry eye 4%, diabetes 2%, corneal degenerations/dystrophy 1.5%, contact lens use 1%, none 3.5%. The most common offending agent causing trauma leading to ulceration was vegetative matter. Out of 133 cases of trauma 74 (55.6%) cases had injury due to vegetative materials.

Table 1: Causes for corneal ulcer.

Factors associated	Bacterial	Fungal	Mixed	Sterile	Total
	No.	No.	No.	No.	No.
Trauma	49	64	6	14	133
Chronic dacrocystitis	13	0	0	4	17
Dry eye	5	1	0	2	8
Steroid usage	7	3	4	0	14
Lid disorder	6	1	0	5	12
Contact lens	2	0	0	0	2
Corneal degeneration	1	0	2	0	3
Diabetes	4	0	0	0	4
None	3	1	0	3	7
Total	90	70	12	28	200

Table 2: Modes of trauma

Agents	Bacterial	Fungal	Mixed	Sterile	Total
	No.	No.	No.	No.	No.
Vegetative matter	16	52	5	1	74
Soil/sand/stone	18	2	0	1	21
Animal tail	2	17	1	2	22
Finger nail	5	0	1	1	7
Unknown	6	2	0	1	9
Total	37	73	7	6	133

Central cornea was involved most commonly in fungal keratitis (29.41%) and inferonasal in bacterial keratitis (22.25%). 65% cases had> 5 mm^2 surface area of cornea involved. 65% had visual acuity in the range of PL PR – 6/60 at the time of presentation signifying late presentation.A majority of cases showed involvement $1/3^{rd}$ – $2/3^{rd}$ of corneal thickness i.e., 120 cases (60%). Rolled out/irregular feathery margins were noted in 70.59% cases of keratomycosis. Over hanging margin was more common in bacterial keratitis 79.5%. Hypopyon was present in 76.53% cases of keratomycosis which was higher than hypopyon positive cases of bacterial keratitis 68.5%. 69% cases of fungal keratitis showed thick and fibrinous hypopyon whereas 62.26% cases of bacterial keratitis showed liquid hypopyon.

Discussion

Microbial keratitis is a common, potentially sight threatening ocular infection that may be

caused by bacteria, fungi, viruses or parasites. Bacterial keratitis rarely occurs in normal eye because of the human cornea's natural resistance to infection. However, predisposing factors such as corneal injury, contact lens wear, ocular adnexal dysfunction (including tear film deficiencies), corneal abnormalities and other exogenous factors, systemic disease and immunosuppression may alter the defense mechanisms of the outer eye and permit bacteria to invade the cornea [14].

Corneal ulcer showed a higher prevalence i.e., 148 cases (74%) in the economically active age group 21-60 years. Basak et al. [10] showed 49.3% of keratitis cases were 21-40 years age group. Sharma et al. [14] showed 83% of cases were in 21-60 years age group with maximum incidence noted in the age group of 41-60 years.

Male to female ratio of 1.8: 1.M. Srinivasanet al[1] which showedoverall ratio of male to female patients of 1.6 to 1. It can be correlated with active outdoor activities.

Maximum incidence 176 cases (88%) was found in the socio-economically disadvantageous group. Out of 200 patients 164 (82%) were from rural areas and 36 (18%) were from urban residents.

History of corneal trauma predisposing to corneal ulceration was the most frequent predisposing factor noted in 133 cases (66.5%), representing 49 cases of bacterial (54.4%) and 64 cases of fungal (91.4%) corneal ulcers respectively. Chronic dacryocystitis was noted in 17 cases (8.5%). Lid disorder was noted 12 cases (6%). 4 patients had facial palsy with lagophthalmos, 4 had entropion, 2 had trichiasis, 2 had distichiasis. Chronic topical steroid use was noted in 14 cases (7%). Dry eye conditions representing 8 cases (4%) were noted. Corneal dystrophy/degeneration was noted in 3 cases (1.5%). Contact lens use was seen in 2 case (1%), as very few percentage of contact lens user are found in this area and 4 patients had diabetes.

The present results are similar to the work done by M. Srinivasan et al. [1] which showed trauma was most common (69.4%) followed by chronic dacryocystitis (4.60%) followed by lid disorder in (3%). Other causes noted were leprosy, diabetes, dry eye, corneal anaesthesia following herpes simplex or herpes zoster infections, corneal degeneration/dystrophy. Dr Suresh Prasad et al. [16] in their study noted 92% of their cases gave history of corneal trauma Basak et al. [10] and Norina et al. [13] showed 54.61% and 50% of cases of trauma were due to vegetative materials respectively. Hence, encouraging people to use protective measures like protective glasses, caution about penetrating objects, immediate referral of patients in any ophthalmic disorder can reduce the burden of corneal ulcer drastically.

Central locations were the most frequently observed in fungal ulcers i.e., 24 cases (34.2%). Most common sites of the cornea involved wasinfero-nasal in bacterial keratitis 27 cases (30%). The next most commonly involved site was central in bacterial i.e., 18 cases (20%) andinferotemporal in 28 cases (31.1%) of fungal corneal ulcers.The incidence of anterior chamber involvement with hypopyon was slightly more in cases of fungal keratitis 53 cases (75.71%) compared to 60 cases (66.66%) of bacterial keratitis.

In our study staphylococcus epidermidis was the predominant bacterial isolate (37.04%), followed by staphylococcus aureus (24.07%), Streptococcus pneumoniae (22.22%), Coagulase negative staphylococcus (CONS) (7.41%), Non hemolytic streptococci (3.70%), Atypical E coli. (3.70%) Pseudomonas aeruginosa(1.85%).The results were consistent with the work done by Gopinathan et al. [17] and Schaefer et al. [18] who found the Staphylococcus epidermidis to be the most common bacterial isolate followed by staphylococcus aureus. But it differs with work done by M. J. Bharathi et al. [15] and M. Srinivasan et al. [1] who found the Streptococcus pneumoniae to be the most common bacterial isolate followed by staphylococcus species. This indicates regional variation in micrbiological profile of corneal ulcer and importance of microbiological culture from infective tissues.

In our study the predominant fungal isolates was Fusarium sp. (33.3%) and Aspergillus spp. (33.3%) followed by Rhizopusspp (14.29%), Mucor (9.52)% unidentified filamentous fungi (9.52%). Filamentous fungi accounted for 76.18% of total 34 cases of fungal keratitis. Results in our study are similar to other studies carried out in tropical countries, where filamentous fungi specially the Fusarium sp. is the predominant fungal isolate from the corneal scraping and culture of fungal keratitis cases. Laila et al. [19] showed in their study aspergillus was the most common 45.4% followed by fusarium species 24.24%. Gopinathan et al. [18] in their study showed fusariumspp 36.6% followed by aspergillusspp 25% of fungal isolates.

Direct smear examination was done by gram's staining and for fungi by 10% KOH mount and gram's stain. Gram stain had sensitivity of 70.8%, specificity of 84.6%, Positive Predictive Value 80.95%, Negative Predictive Value 75.86%. P value <0.001(X^2 test). KOH had sensitivity of 80.95%, specificity of 96.5%, Positive Predictive Value 94.4%, Negative Predictive Value 87.5%. p value<0.001(X^2

test). Possible reason for low sensitivity may be due to inadequate specimens, insufficient microbiological investigation. However, it can be seen that most cases will be guided reliably by their Gram stain results if culture facilities are not available.

A clinical diagnosis of bacterial corneal ulcer was put on the basis of presence of corneal infiltrates, epithelial defects, conjunctival hyperaemia, cilliary congestion, mucopurulant exudates and presence of hypopyon.

A provisional diagnosis of bacterial corneal ulcer was given to 53 cases (excluding viral or fungal appearing cases) on the basis of round corneal ulcer with over hanging margins conjuctival hyperemia, circumciliary congestion and type of hypopyon. Out of 106 such cases only bacterial isolates were obtained from 82 cases with sensitivity of 85.42% and specificity of 76.92% Positive predictive value of 77.35%, Negative predictive value of 85.11%. p value <0.001 (X^2 test).

The clinical diagnosis of fungal corneal ulcer was put on the basis of a dry looking ulcer with rolled out margins and feathery finger like extensions into the surrounding stroma, presence of large hypopyon and presence of satellite lesions and immune ring.

70 out of 94 clinically suspected fungal ulcers yielded growth in culture, giving a sensitivity of 83.33% and specificity of 79.31%, Positive predictive value of 74.46%, Negative predictive value of 86.8%. P value <0.001. (X^2 test). Study done by Bharathi MJ. [20] stated that the sensitivity of clinical diagnosis of bacterial keratitis made by ophthalmologist was 83% and of fungal keratitis was 94.1%.

Conclusion

Central corneal ulceration is a common problem in surroundings of Raichur and most often occurs after a superficial corneal injury with organic material. Bacterial keratitis is marginally higher than fungal keratitis. Staphylococcus epidermidis is most common bacterial and Fusarium sp. And Aspergillusspare the most common fungal isolate.

Staining by Grams and KOH efficiently establishes the diagnosis therefore can be used in the management of corneal ulcer to start the prompt treatment as corneal ulcer is a medical emergency.

The microbiological profile helps the ophthalmologists to start the specific treatment directed against the causative organisms.

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