Infectious keratitis in leprosy

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Abstract

***Aim*—To describe leprosy characteristics, ocular features, and type of organisms that produce infective corneal ulcers in leprosy patients.**

***Method*—The records of all leprosy patients admitted for treatment of corneal ulcers between 1992 and 1997 were reviewed.**

***Results*—63 leprosy patients, 53 males and 10 females, are described. 16 were tuberculoid and 47 lepromatous. 25 patients had completed multidrug therapy. 10 patients had face patches, eight had type I reaction, and 10 had type II reaction. 43 (68%) patients had hand deformities. In 54% of patients pain was absent as a presenting symptom. 19 patients gave a history of trauma. In 15 patients ulcers had also occurred on the other eye, five of them having occurred during the study period and the rest before 1992. Of the 68 eyes with corneal ulcers, 28 had madarosis, 34 had lagophthalmos, nine had ectropion, three had trichiasis, six had blocked nasolacrimal ducts, and 39 decreased corneal sensation. In 14 eyes, a previous lagophthalmos surgery had been done. 16 patients were blind at presentation. 32% of ulcers were located centrally. After treatment only 18% of the eyes showed visual improvement. Five types of fungus were cultured, two of them rare ocular pathogens.**

***Conclusions*—Corneal ulcers occur more in males and in the lepromatous group of patients. Decreased corneal sensation, lagophthalmos and hand deformity are closely associated. Indigenous treatment and late presentations were notable in many patients. Visual outcome is not good. There is increased risk of developing an ulcer in the other eye. Fungal corneal ulcers are not uncommon.**

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Leprosy is a chronic granulomatous disease caused by the acid fast bacillus *Mycobacterium leprae*. It has affected 10–12 million people worldwide. The majority of these patients are found in the Indian subcontinent. The disease produces a number of ocular problems. It is estimated that 3.2% of all leprosy patients are blinded by the disease.[1] Although the disease represents a leading cause of blindness from an infectious disease some of the complications that lead to blindness have not been investigated adequately. One such complication is infectious keratitis. Available literature on ocular leprosy only highlights the paucity of information on the aetiology and pathogenesis of corneal ulcers occurring among leprosy patients. Since little information exists on the nature of corneal ulcers in leprosy, we retrospectively studied leprosy characteristics, ocular features, and the type of organisms that produced infective corneal ulcers in leprosy patients admitted for that condition in our hospital from 1992 to 1997 and present our findings in this paper.

Patients and methods

All records of leprosy patients who had developed corneal ulcers and who were admitted into the eye ward of the Schieffelin Leprosy Research and Training Centre (SLRTC) in south India for treatment between 1992 and 1997 were reviewed. The demography characteristics, leprosy details, ocular findings, smear and culture investigation results of corneal scrapings, and treatment details were coded and entered into a computer. The leprosy details included the current leprosy classification, antileprosy treatment status, skin smear status for acid fast bacilli (AFB), face patches, reaction states, duration of disease, and deformity status.

Results

Sixty eight eyes with corneal ulcers in 63 leprosy patients were reviewed. Fifty three (84.4%) were males and 10 (15.6%) were females. The age of the patients ranged from 41 to 78 years with a mean of 58.6 (SD 9) years. Four patients belonged to the tuberculoid (TT) type of leprosy, 12 to borderline tuberculoid (BT), 13 to borderline lepromatous (BL), and 34 to the lepromatous leprosy (LL) group. According to another classification by the World Health Organisation (WHO) 16 patients belonged to the paucibacillary group (PB) while 47 patients belonged to the multibacillary group (MB). Treatment details showed that 25 patients had been released from antileprosy treatment after receiving multidrug therapy (MDT). A face patch, defined as a hypopigmented patch occurring over the malar area or over the eye lids, was present in 10 patients. Eight patients had had type I or reversal reactions, 11 had had type II or erythema nodosum leprosum (ENL) reactions and the rest of the patients had no history of having had a reaction. The duration of leprosy ranged from 3 to 50 years with a mean of 26.28 (11.6) years. At the time of having the corneal ulcer only two patients were found to be skin smear positive for AFB but 27 of the patients had been smear positive in the earlier part of their disease. While only three of the patients had ulcers on the hand, 43 patients

Table 1 Site of corneal ulcer

Site	Corneal ulcers		
	Right eye	*Left eye*	*Total*
Central	11	11	22
Upper temporal	3	2	5
Upper nasal	1	0	1
Lower temporal	10	13	23
Lower nasal	1	9	10
Subtotal ulcers	3	4	7
Total	29	39	68

had grade II deformity according to the WHO classification of deformity in leprosy. None of the patients were known diabetics or hypertensives.

Twenty nine patients (46%) presented with pain in the ulcerated eye. The other presenting complaints were lacrimation in 24 patients, redness of the eyes in 21 patients, photophobia in seven patients, decreased vision in 11 patients, excessive discharge in the eyes in eight patients, and swelling of the lids in one patient. A definitive history of trauma to the eyes that developed corneal ulcers was given by 19 patients. Seven of these patients said they rubbed their eyes excessively before developing an ulcer; 11 of them gave history of having been injured with vegetable matter and one gave a history of injury with sand. Six patients had some form of indigenous village treatment. These comprised instilling fresh chicken blood or mothers' milk or a juice extract of some leaves on the eye that had suffered trauma. Eleven of the patients had started treatment with some eye drops that were left over from neighbours or friends who had partly used them for their eye problems some time before.

There was documentation of corneal ulcers having occurred in the other eye in 15 patients. Five of them occurred in these patients during the study period between 1992 and 1997, the others before 1992; 13 of these were male and of the lepromatous group. Five of them (33%) had a face patch; nine (60%) had decreased corneal sensation.

The duration between the occurrence of the ulcer and presentation at the eye clinic of our hospital varied from patient to patient. In 16 patients this information was not available. Six of them presented within 3 days, 14 of them presented after 3 days but within a week, 24 of them presented after 1 week but before 1 month, and there were three patients who presented after 6 weeks. Only 10 patients had been to places where some form of allopathic eye care was available.

Twenty nine of the ulcers occurred in right eyes and 39 of them in left eyes. The location of the ulcers is given in Table 1. Of the 68 eyes with corneal ulcers, 28 had madarosis, 34 had lagophthalmos, nine had ectropion, three had trichiasis, six had blocked nasolacrimal ducts, and corneal sensation was impaired in 39 eyes. Eighteen eyes had both lagophthalmos and reduced corneal sensation. In 14 eyes, a previous corrective surgical procedure for lagophthalmos had been done. Ten eyes had had lateral tarsorrhaphy and four eyes had undergone temporalis muscle transfer (TMT) surgery.

Sixteen patients were blind (less than 3/60 in the better eye) when they presented with infectious keratitis at the hospital. At discharge from the hospital 12 patients remained blind. The visual acuities of the ulcerated eyes at presentation at the hospital and at discharge is given in Table 2. Among the complications that developed as a result of the corneal ulcer, 27 eyes had hypopyon, in 11 eyes the cornea perforated, four developed anterior synechia, and 25 developed posterior synechia. Five eyes presented/progressed towards endophthalmitis and had to be finally eviscerated. Out of the 27 eyes having hypopyon, seven were found to be fungal corneal ulcers.

Gram stain was done on 40 corneal scraping specimens; 28 were negative for any organisms. The list of organisms diagnosed by Gram stain is given in Table 3. Potassium hydroxide (KOH) staining of corneal scrapings was done in 44 ulcers. Fungal elements were found in eight specimens stained with KOH. Cultures for aerobic organisms and fungal growth were done in 27 ulcers; 13 showed no growth of any organisms. In five only fungal growth was observed. In one both fungus and aerobic bacteria were grown. Eight were pure bacterial cultures. The list of organisms is given in Table 4. No AFB were seen in the 15 corneal scrapings that were stained with Zeihl–Neelsen stain.

Most patients received treatment with topical ciprofloxin eye drops alternating with ketaconazole eye drops instilled every waking hour. The ketoconazole drops were prepared by mixing a powdered tablet of ketoconazole (200 mg) in 5 ml of hydroxypropyl methylcellulose. Mydriatic drops such as atropine and homatro-

Table 2 Visual prognosis of the ulcerated eyes

Visual acuity	At presentation	At discharge		
		Improved	*Same*	*Decreased*
<3/60	49	10	39	0
3/60–5/60	1	1	0	0
6/60–6/18	13	1	10	2
6/12–6/6	5	0	2	3
Total	68	12	51	5

Table 3 List of organisms seen with Gram stain

Type of organisms	*Number*
Gram positive cocci	8
Gram positive bacilli	2
Gram +ve and Gram −ve bacilli	2
Fungal hyphae	5

Table 4 Organisms cultured from the corneal ulcers

Organism	*Number*
Bacterial:	
Pseudomonas aeruginosa	4
Streptococcus pneumoniae	2
Staphylococcus epidermidis	3
Enterococci	2
Corynebacterium species	1
Proteus rettgeri	1
Fungal:	
Aspergillus terreus	1
Aspergillus flavus	2
Alternaria alternaria	1
Volutella spp	1
Unidentified by subculture	1

pine were used in all patients. If no fungal infection was suspected only ciprofloxin eye drops were used.

Discussion

Reports on ocular complications among leprosy patients are many. Although these reports do cover various corneal complications, the paucity of studies on infective keratitis in leprosy is conspicuous. In a group of patients where the cornea is extremely vulnerable and prone to secondary infection, studies on the prevalence, incidence, aetiopathogenesis, and treatment of infective keratitis are of utmost importance. Elucidating risk factors that lead to these infections can, to a great extent, minimise the amount of blindness and ocular morbidity that occurs among leprosy patients.

This study shows that the majority of corneal ulcers developed in male leprosy patients (84%). It is known that in most parts of the world males are affected by leprosy more than females. This preponderance of males has been observed in India and one reason given is that males in general expose themselves to greater risks of infection as a result of their lifestyle.[2] The ulcers occurring more commonly in males could be related to this factor.

On the other hand, women may tend not to seek medical help even when it is urgently required. Two thirds of ulcers occurred in patients belonging to the multibacillary or lepromatous group. It is well known that the more extensive and highly bacilliferous types of leprosy (lepromatous) carry a much greater risk of developing impairments and disability than the less extensive and relatively low bacilliferous types (tuberculoid).[3] In 25 patients (40%) the corneal ulcers had occurred after they had completed their multidrug therapy and had been released from antileprosy treatment. This underscores the importance of continuing ocular care among patients who have been released from treatment.

The majority of the patients admitted with corneal ulcers had decreased corneal sensation. Although infective organisms such as herpes simplex are known to decrease corneal sensation, the only bacterium that is known to substantially reduce corneal sensation is *Mycobacterium leprae*. There are several ways in which impaired corneal sensation can lead to the development of infectious keratitis. In patients with decreased corneal sensation, injuries to the cornea can often be ignored or go unnoticed for a significant period of time. Pain was a presenting symptom in less than half of the patients in this study. It is only when signs and symptoms become overtly manifest that leprosy patients with infectious keratitis on the cornea with decreased corneal sensation seek remedial measures. These are often inadequate and the general outcome is dismal. Intact corneal sensation is also an important factor in tear production and it is known that with a decrease in corneal sensation there is a decrease in tear secretion.[4] Patients with leprosy are at risk of developing keratoconjunctivitis sicca or dry eye.[5] Foreign body sensation, a major symptom in this condition can induce the patient to rub the eye excessively. When hands are deformed, callous, or ulcerated with poor sensation, they can easily cause injury to an itchy eye with decreased corneal sensation. Sixty three per cent of the leprosy patients with corneal ulcers were found to have grade 2 hand deformities. Three of them had ulcers on their hands and there is a possibility that pathogenic organisms from these hand ulcers were transferred to the cornea by rubbing the eyes. Unfortunately the hand ulcers of these patients were not investigated by culture. Although a definite history of rubbing the eyes excessively before the development of the corneal ulcers could be obtained from the charts of seven (11%) patients, 43 patients (68%) denied having had any form of trauma occurring on their eyes. Decreased corneal sensation can also retard the healing of corneal ulcers. Normal corneal sensation is essential for the proper maintenance of an intact corneal epithelium. As corneal epithelial metabolism, mitosis, and migration are considered to be dependent on intact sensory neurons from the fifth cranial nerve,[6] healing of an infectious keratitis in a leprosy patient with impaired corneal sensation is likely to be prolonged, difficult, and the end results not very rewarding. Only in 12 (18%) out of the 68 eyes with corneal ulcers was there appreciable improvement in vision after completion of treatment. The site of the corneal ulcer, in most cases being centrally located (32%), also contributed to poor visual recovery.

Although decreased corneal sensation is one of the foremost risk factor in the development and progress of infectious keratitis in leprosy there appear to be no easy solutions in dealing with it. Methylcellulose applications, used regularly 5–6 times a day, have been shown to give some protection to eyes that had decreased corneal sensation and lagophthalmos.[7] Educating the patients not to rub their eyes is an important measure that is not easily followed.[8] In ulcers that are difficult to heal a temporary lateral tarsorrhaphy can be beneficial.[9] Lagophthalmos was present in 34 eyes (50%) and is an obvious risk factor to the development of corneal ulcers. Preventive and curative treatment essentially consists of decreasing the width of the palpebral fissure by various surgical procedures. In our study 14 eyes (20%) that had already had such surgical procedures developed corneal ulcers. It was not possible to find out from the records how many of these eyes had protective Bell's phenomenon or how many of them had their cornea covered by the upper lid on gentle closure of the eyes. However, it is important to note that merely doing a surgical procedure does not afford immunity to developing infectious keratitis in leprosy patients with lagophthalmos.

The superstitious beliefs of the rural community from which many leprosy patients are derived, contribute greatly to the morbidity of eyes that develop infectious keratitis. Bizarre treatment practices like instilling fresh chicken blood, mothers' milk, and juice extracts of certain leaves on the traumatised eye are still prevalent in some rural areas of south India.

Self medication with partly used, outdated, eye drops is also quite common. Although not much is known how exactly these practices directly affect the ulcerated eye, it often causes patients to delay presentation at a place where good ophthalmic care is available. This delay is sometimes disastrous and in many instances has left the ophthalmologist with no option other than to eviscerate the eye. Five such eyes in this study were eviscerated.

Fifteen (24%) of the 63 patients had had a corneal ulcer occurring in the opposite eye previously. An interesting feature in these patients was that five (33%) of them had a face patch. Face patch occurred in only 10 of the 63 patients overall. A leprosy patient who develops a corneal ulcer in one eye has a likelihood of developing a similar ulcer in the other eye if the same ocular and environmental factors that induced the ulcer in the other eye continue to exist. Measures to try and remove these factors are essential coupled with stringent eye care.

The growth of a number of soil fungi in the ulcers of these patients relate to the agrarian work most of them do for a living. Although *Aspergillus* sp was the most common fungus that was cultured, rare pathogens like *Volutella* spp and *Alternaria* spp[10] were also grown. In many leprosy endemic areas facilities for KOH staining and fungal culturing either do not exist or are too expensive to undertake as a routine investigation for a corneal ulcer. In such instances infectious ulcers that occur after trauma with vegetable matter should be considered to be of fungal origin and should be treated as such. It would be prudent to treat all such ulcers with broad spectrum topical antibiotic drops alternated with topical antifungal drops. There have been reports of unusual corneal infections caused by mycobacteria,[11 12] but corneal smears taken from 15 ulcers failed to show any acid fast organisms.

Conditions that are favourable for the development of a corneal ulcer already exist in most leprosy patients. Poverty, nutritional deficiency, illiteracy, adverse superstitious beliefs, agrarian occupation, limb ulcers, poor hygiene, topical and oral steroid therapy, nasolacrimal duct obstruction, decreased corneal sensation, keratoconjunctivitis sicca, trichiasis, ectropion, entropion, and lagophthalmos associate in many ways to render a susceptible cornea vulnerable to a number of invading organisms. Educating patients affected with leprosy about basic eye care techniques is very important. Each day, as a routine, the patients or their relatives and friends should be taught to look for redness or anything that looks abnormal in the eyes and to perform a simple visual acuity test daily on each eye, separately. Inculcating in these patients an urgency to report anything abnormal in their eyes would go a long way in decreasing ocular morbidity in leprosy.

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