Infectious keratitis in leprosy

Deepa John, Ebenezer Daniel

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 ektropion, 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 fungi 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.

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. 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...
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 one 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 Ziehl–Neelsen stain.

Most patients received treatment with topical ciprofloxin eye drops alternating with ketoconazole 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 homatropine were used in seven patients, decreased vision in 11 patients, and swelling of the lids in one patient. 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.

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<table>
<thead>
<tr>
<th>Site</th>
<th>Right eye</th>
<th>Left eye</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>11</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Upper temporal</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Upper nasal</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Lower temporal</td>
<td>10</td>
<td>13</td>
<td>23</td>
</tr>
<tr>
<td>Lower nasal</td>
<td>1</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Subternal ulcers</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>39</td>
<td>68</td>
</tr>
</tbody>
</table>

Table 2 Visual prognosis of the ulcerated eyes

<table>
<thead>
<tr>
<th>Visual acuity</th>
<th>At presentation</th>
<th>At discharge</th>
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</thead>
<tbody>
<tr>
<td>&lt;3/60</td>
<td>49</td>
<td>10</td>
</tr>
<tr>
<td>3/60–5/60</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6/60–6/18</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>6/12–6/6</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 3 List of organisms seen with Gram stain

<table>
<thead>
<tr>
<th>Type of organisms</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gram positive cocci</td>
<td>8</td>
</tr>
<tr>
<td>Gram positive bacilli</td>
<td>2</td>
</tr>
<tr>
<td>Gram +ve and Gram −ve bacilli</td>
<td>2</td>
</tr>
<tr>
<td>Fungal hyphae</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 4 Organisms cultured from the corneal ulcers

<table>
<thead>
<tr>
<th>Organism</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacterial:</td>
<td></td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>4</td>
</tr>
<tr>
<td>Streptococcus pneumoniae</td>
<td>2</td>
</tr>
<tr>
<td>Staphylococcus epidermidis</td>
<td>3</td>
</tr>
<tr>
<td>Enterococci</td>
<td>2</td>
</tr>
<tr>
<td>Corynebacterium species</td>
<td>1</td>
</tr>
<tr>
<td>Proteus retigii</td>
<td>1</td>
</tr>
<tr>
<td>Fungal:</td>
<td></td>
</tr>
<tr>
<td>Aspergillus terreus</td>
<td>1</td>
</tr>
<tr>
<td>Aspergillus flavus</td>
<td>2</td>
</tr>
<tr>
<td>Alternaria alternaria</td>
<td>1</td>
</tr>
<tr>
<td>Volutella spp</td>
<td>1</td>
</tr>
<tr>
<td>Unidentified by subculture</td>
<td>1</td>
</tr>
</tbody>
</table>
Infectious keratitis in leprosy

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than the less extensive and relatively low bacil-
limited in the upper lid on gentle clo-
ated to the cornea by rubbing the eyes. Unfor-
without eye drops or spectacles. However, it is
The majority of the patients admitted with
corneal ulcers had decreased corneal sensa-
tion. Although infective organisms such as her-
ves simplex are known to decrease corneal
sensation, the only bacterium that is known to
substantially reduce corneal sensation is Myco-
Bacterium leprae. There are several ways in
which impaired corneal sensation can lead to
the development of infectious keratitis. In
patients with decreased corneal sensation, in-
juries to the cornea can often be ignored or
go unnoticed for a significant period of time.
Course 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 inade-
quate 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. Patients with
leprosy are at risk of developing keratoconjunc-
vitis sicca or dry eye. 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 trans-
ferred to the cornea by rubbing the eyes. Unfor-
unately 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 sensa-
tion is essential for the proper maintenance of an
intact corneal epithelium. As corneal epithelial
metabolism, mitosis, and migration are consid-
ered to be dependent on intact sensory neurons
from the fifth cranial nerve, healing of an infec-
tious keratitis in a leprosy patient with impaired
corneal sensation is likely to be prolonged, diffi-
cult, and the end results not very rewarding.
Only in 12 (18%) out of the 68 eyes with corneal
ulcers was there appreciable improvement in
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 de-
creased 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 de-
creasing 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 infec-
tious keratitis in leprosy patients with lagoph-
thalmos.

The superstitions of the rural com-

munity 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 cer-
tain 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 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 anti-fungal drops. There have been reports of unusual corneal infections caused by mycobacteria, 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, 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 eye 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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