Chronic alcoholism and microbial keratitis*

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SUMMARY In a series of 227 consecutive, non-referred patients with microbial keratitis an analysis of the accumulated hospital records showed that one-third were associated with chronic alcoholism. The diagnosis of alcoholism was usually unsuspected on admission to hospital. The microbial pathogenesis in these patients was distinctive; coagulase-negative staphylococci, α - and β -streptococci, moraxellae, enteric Gram-negative bacilli, and polymicrobial infections were unusually prominent. *Pseudomonas aeruginosa* was uncommon. Trauma, exposure, bullous keratopathy, other external ocular diseases, and self-neglect were the major recognised predisposing causes. The nutritional, toxic, and immunological sequelae of alcoholism may also have been contributory. Ophthalmologists should be alert to the diagnosis of chronic alcoholism in their patients. Chronic alcoholism may be an important and underrated risk factor for microbial keratitis.

It has been suspected that the pathogenesis and pattern of microbial keratitis in the chronic alcoholic may differ from that usually described and defined principally by an uncommonly high prevalence of moraxella infection.¹⁻⁴ However, no formal study has been undertaken. In one hospital based series of patients with a high rate of chronic alcoholism 45% of cases of microbial keratitis from 1965 to 1970 were caused by moraxellae.³ Improvements in nutrition and sanitation were cited as possible explanations for the subsequent decline in moraxella prevalence at the same institution to 5% over the period 1971-4.³ There may also have been important demographic factors, including alterations in the catchment area of the hospital,¹ to explain this change.

An accepted definition of chronic alcoholism is excessive, persistent drinking that interferes with the person's health, interpersonal relationships, legal position, or means of livelihood.⁵ The diagnosis is often overlooked by health care professionals and should be specifically sought, particularly in high-risk

groups.⁶ In hospital based populations chronic alcoholism has been reported in 8 to 18% of US private hospital patients,^{7,8} with even higher levels in metropolitan public hospitals in the USA and UK.⁹⁻¹² The rates in female inpatients have been reported to be one-third to two-thirds those of men.^{8,9,11} An estimated 10% of the United States adult population is believed to have a drinking problem.¹³⁻¹⁴

Published series of patients with microbial keratitis have not recorded many alcoholics.¹⁻³ As Los Angeles County has one of the higher rates of alcoholism in the United States^{15,16} we carefully studied the prevalence of chronic alcoholism in our retrospective cases of microbial keratitis so as to evaluate the pattern of ocular disease and gauge the particular problems of management.

Subjects and methods

A total of 227 consecutive patients with microbial keratitis were admitted to the Los Angeles County-University of Southern California Medical Centre (LAC-USC) over the 11-year period, 1 July, 1972 to 30 June, 1983. LAC-USC is a non-referral, primary care facility. The microbial aetiology of the corneal infections was investigated by standard techniques.¹⁷⁻¹⁹ Bacterial keratitis was defined as an inflammatory infiltrate and ulceration of the corneal stroma, associated with an epithelial defect, from which one or more microbial species were cultured;

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all but trace isolates were reported as positive. Ophthalmological, microbiological, and medical data were recorded, according to a detailed protocol, by reviewing the accumulated, hospital inpatient and outpatient charts from all specialities. As LAC-USC is the main primary-care institution for Los Angeles County, lifetime medical histories were frequently available.

Seventy-two individuals (32%) were diagnosed as chronic alcoholics, though the diagnosis was usually unsuspected during the ophthalmic admission. Admissions to the inpatient detoxification service were recorded in many patients' charts. In other instances the diagnosis had been based on a combination of the social and behavioural history, clinical signs, and biochemical findings, or the finding of major medical complications of chronic alcoholism.

Results

The racial distribution of the alcoholic group (72 patients) was: 54% white; 28% black; 12% hispanic. It contrasts with that of the non-alcoholic patients (155 patients): 27% white; 22% black; 40% hispanic. Sixty-six patients were male and there were six females. Forty-four left eyes and 28 right eyes were involved. Ulcers were small (<2 mm) in five cases, moderate (2–6 mm) in 50, and large (>6 mm), in 17 cases. There was more than a six-fold difference in prevalence between the months of highest (January) and lowest (February and August) incidence.

To investigate the nature of the alcoholic group we investigated the lifetime incidence of several major medical complications of chronic alcoholism; the results are shown in Table 1. Two patients also had a history of narcotic drug abuse, four patients suffered from a severe psychotic or major affective disorder, and four patients were diabetic. Trauma was implicated as a factor in 23 patients (32%) and local ocular disease in 33 (46%). One-fifth had either bullous keratopathy or ocular exposure. It is noteworthy that no predisposing factors were recorded in 25 patients (35%).

Table 1 Recorded lifetime incidence of major medical complications of chronic alcoholism

	Percentage	Number
Itinerancy	19	14
Delirium tremens	22	16
Seizure disorders	18	13
Acute and chronic brain syndromes*	15	11
Hepatic cirrhosis (biopsy-proved)	15	11
Known death from hepatic complications	10	7
Chronic pancreatitis	4	3

*Includes Wernicke's encephalopathy, alcoholic dementia, cerebellar degeneration, and Korsakoff's psychosis.

Fifty-nine (82%) of the 72 alcoholic patients were culture-positive, and 32% of these cultures showed polymicrobial infection. The remarkable features of the microbiological spectrum (Table 2) were the higher than normal prevalences of coagulase-negative staphylococci,^{1,26} α - and β -haemolytic streptococci, *Moraxella* spp., and enteric Gram-negative bacilli. *Pseudomonas aeruginosa* was surprisingly uncommon and found in only four patients (6%). Fungi were also uncommon.

Table 3 compares the rates of complications and operations between the alcoholic and non-alcoholic patients. There was a tendency for more severe disease in chronic alcoholics. Self-neglect was probably an important factor. Whereas 52% of the non-alcoholic group presented to an ophthalmologist within 72 hours of developing symptoms, only 21% of the chronic alcoholics had reported by this time. In fact 42% of the alcoholics did not seek medical attention for at least one week. It was notable that a significant minority complained of little or no pain.

Table 2 Microbial causation of corneal ulcers in a population of chronic alcoholics

	Percentage of Patients*	Numbers*†
<i>Gram-positive cocci</i>		
Coagulase-negative staphylococci	28	20 (4)
<i>Staphylococcus aureus</i>	15	11 (7)
<i>Streptococcus pneumoniae</i>	13	9 (4)
β -haemolytic streptococci	11	8 (3)
α -haemolytic streptococci	7	5 (5)
γ -haemolytic streptococci	1	1 (1)
Microaerophilic streptococcus	1	1 (0)
<i>Gram-positive bacilli</i>		
<i>Bacillus subtilis</i>	1	1 (0)
<i>Clostridium</i> spp.	1	1 (0)
<i>Gram-negative cocci/coccobacilli</i>		
<i>Moraxella</i> spp.	13	9 (5)
<i>Branhamella catarrhalis</i>	1	1 (0)
<i>Gram-negative bacilli</i>		
<i>Proteus</i> spp.	7	5 (2)
<i>Pseudomonas aeruginosa</i>	6	4 (1)
<i>Enterobacter</i> spp.	4	3 (3)
<i>Citrobacter</i> spp.	3	2 (0)
<i>Klebsiella</i> spp.	1	1 (1)
Other <i>Pseudomonas</i> spp.	1	1 (0)
<i>Aeromonas</i> spp.	1	1 (1)
<i>Haemophilus influenzae</i>	1	1 (1)
<i>Fungi</i>		
<i>Candida albicans</i>	1	1 (1)
<i>Penicillium</i> spp.	1	1 (1)
<i>Cladosporium</i> spp.	1	1 (1)
Negative cultures	18	
Polymicrobial cultures	32	

*n=72. †Figures in parentheses indicate the number of polymicrobial infections.

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Table 3 Comparisons of rates of complications and operations in microbial keratitis in chronic alcoholic and non-alcoholic patients

	Chronic alcoholic group (72)	Non-alcoholic group (154)
Hypopyon	33%	33%
Descemetocoele/perforation	22%	15%
Perforation occurring >3 days after admission	8%	4%
Penetrating/lamellar keratoplasty	18%	12%
Glue/soft contact lens	11%	5%
Enucleation/evisceration	6%	6%
Soft contact lens/epithelial failure	4%	4%
Mean admission time in days (±SD)	17.6 (±12.7)	14.4 (±10.9)

Discussion

Chronic alcoholism was the most prevalent association identified in 227 consecutive patients admitted to LAC-USC with microbial keratitis. As these chronic alcoholics were admitted for ophthalmological treatment and not for alcoholism, it is remarkable that the available lifetime incidence figures of alcohol-related physical diseases were closely comparable to data from metropolitan alcoholic units.²⁰⁻²⁴ This lends support to the methodology but, more importantly, suggests that chronic alcoholism may be a major unsuspected risk factor for microbial keratitis. The alcoholism had usually been overlooked during the ophthalmic admission, as it may have been in other series of microbial keratitis patients.

The pathogenesis of microbial keratitis in chronic alcoholics is undoubtedly multifactorial (Table 4). A history of trauma was obtained in one-third of the cases. That trauma played a significant part in this study was also suggested by the predominance of keratitis in left eyes (interpersonal trauma is more usually inflicted with the right hand) and perhaps by the high prevalence of keratitis in the post-Christmas period. Amnesia, mental illness, and deliberate evasion may contribute to an underassessment of the role of trauma in chronic alcoholics, and may account for many of the patients in whom no predisposing factor was recorded (35%). A primary predisposition for chronic alcoholism per se cannot be excluded.

Self-neglect is emphasised by the duration of symptoms at presentation. Coexisting external

ocular disease was important, and bullous keratopathy or ocular exposure were particularly common. The relative contribution of poor hygiene was impossible to quantify. An altered ocular microbial flora has also been reported to occur in alcoholics,³ though we have no contributory data.

There is a well documented increase in several kinds of systemic infectious diseases in chronic alcoholics, an associated increase in duration and severity of infection, and an increased mortality.²⁵ The causation is complex. Acute, reversible alcohol-induced lymphoid toxicity interrelates with protein-calorie, vitamin, and mineral malnutrition, as well as the chronic immunosuppressive effects of both chronic liver disease and chronic alcoholism per se.^{23, 25} The immunological deficits that may sometimes be important contributors to this increased risk of infection have recently been reviewed by Adams and Jordan.²⁵

Such factors presumably had some role in the distinctive spectrum of microbial keratitis seen in our alcoholic patients, compared with those in the non-alcoholic group (unpublished data) and in other series.^{1, 17, 26, 27} Infections involving the usual causative organisms (*Staph. aureus*, *Str. pneumoniae*, and *Pseudomonas aeruginosa*) accounted for only 30% of the total. There was an increased prevalence of infections caused by such relatively uncommon corneal pathogens as *Moraxella*, α - and β -streptococci, and the enteric Gram-negative bacilli. This pattern of infection by organisms with usually low virulence for the cornea was not found in our non-alcoholic patients. It provides indirect evidence to support a significant pathogenetic role for the coagulase-negative staphylococci,^{28, 29} which were the most commonly isolated organisms. The pneumococcus was also more prevalent than in recent series.^{1, 17, 26, 27}

It was not possible to reanalyse the microbiological data by the more stringent criteria that have been recently suggested to increase the discrimination from tear film contamination.³⁰ However, even if the usual conjunctival commensal organisms were to be disregarded (coagulase-negative staphylococci, *Bacillus* and *Branhamella* spp.), we believe unjustifiably, 18% of the cases must still be considered polymicrobial, a genuinely high prevalence.³⁰

The management of microbial keratitis associated with chronic alcoholism presents a formidable challenge, particularly in the decompensated alcoholic. The alcohol withdrawal syndromes, nutritional deficiencies, and medical complications must be treated urgently and expectantly.^{3, 21, 23} The alcoholic patient's co-operation is often difficult to achieve. A sympathetic understanding of the psychopathology of chronic alcoholism, prodigious

Table 4 Aetiology of microbial keratitis in chronic alcoholics

1. Trauma	5. Altered conjunctival flora
2. Exposure during inebriation	6. Neglect
3. External ocular disease	7. Malnutrition
4. Poor hygiene	8. Immunosuppression

patience, and abundant time is necessary to gain the co-operation of many patients before optimal antibiotic therapy¹⁷ can be carried out. If frequent high-dose, topical antibiotic therapy is not psychologically tolerated, we recommend that therapy be centred on regular subconjunctival antibiotic injections, performed through a 0.25 ml subconjunctival bleb of 2% lignocaine, after prior anaesthesia of the conjunctiva with topical 4% cocaine. This is supplemented with as much topical treatment as can be given.

There were increased rates of complications and operations among the chronic alcoholics. The use of isobutyl cyanoacrylate tissue glue for established or incipient corneal perforation is particularly valuable in this situation. As follow-up in decompensated alcoholics is frequently non-existent, we suggest that keratoplasty should generally be performed as a last resort and principally for tectonic reasons, unless there are favourable psychosocial factors or the patient is unioocular.

A diagnosis of chronic alcoholism may be easily overlooked.^{5,9-12,21} Alcoholics who request treatment at general hospitals are prone to minimise their reports of alcohol consumption and deny their alcohol dependence. A recent study at a large medical centre showed that most of the physicians and nurses gave only cursory attention to patients' alcohol histories.³¹ When alcoholism was perceived, physicians frequently still neglected their patients' alcohol dependency.³¹ There is recent evidence from a study in Edinburgh that even a single session of counselling about alcohol abuse (during a medical admission) can significantly improve the alcoholic outcome at one year.³² It should be the goal of all physicians actively to solicit their chronic alcoholic patients to take appropriate treatment before irreversible physical or psychological problems develop.

An alcohol history should be taken from every patient with microbial keratitis. A good indication can be gained by asking what the patient has drunk in the previous week. If the answer is nothing, the patient is unlikely to be an active alcoholic. Several brief alcoholism screening questionnaires have been devised.³³ Alternatively, discriminant questions can be asked independently concerning the quantity and frequency of drinking,¹² domestic arguments over drinking, possible fights while drinking, feelings about excessive drinking, morning drinking, and binges, and whether there have been work difficulties, loss of friends, arrests, or financial difficulties resulting from alcohol abuse.^{21,31} An interview with a spouse or close contact can also be revealing.

It is important for ophthalmologists to address the problem of chronic alcoholism in their patients and assume responsibility for its identification. Our data

suggest that microbial keratitis patients are a high-risk group for chronic alcoholism. Alcoholic screening can be easily incorporated into ophthalmic history taking, particularly in cases of microbial keratitis, ocular trauma, and optic neuropathy. Preventive care of the external eye would also probably reduce the toll of microbial keratitis in the chronic alcoholic.

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