

Haemophilus influenzae corneal ulcer in a therapeutic contact lens wearer

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SUMMARY *Haemophilus influenzae* is an unusual corneal pathogen and an unusual cause of corneal ulcers in Western society. In previous reports corneal complications from *H. influenzae* have been secondary to a conjunctivitis. The first case of a primary *H. influenzae* corneal ulcer as a complication of therapeutic contact lens wear is presented. Since other uncommon bacteria have been reported as causes of contact lens related corneal ulcers, the bacteriology of contact lens related corneal ulcers is reviewed. Ophthalmologists need to be aware that *H. influenzae* infections in adults are becoming more frequent.

Haemophilus influenzae is an unusual corneal pathogen in Western society. We present what we believe to be the first reported case of a primary *H. influenzae* corneal ulcer which occurred in a patient who was being treated with a therapeutic soft contact lens for painful bullous keratopathy secondary to Fuchs's dystrophy.

Case report

A 77-year-old man was examined at the North Carolina Memorial Hospital during April 1979 because of intermittent left eye pain. Initial ophthalmic examination revealed a best corrected visual acuity of 6/7.5 in the right eye and 6/15 in the left eye. Biomicroscopic examination showed the inferior half of the left cornea to have bullous oedema. Superficial, inferior neovascularisation was present. Confluent central guttata and pigmentation of the central endothelium were noted in both corneas. Central corneal sensation was normal in both eyes, and pachymetry showed a right corneal thickness of 0.60 mm. Applanation intraocular pressures measured with the MacKay-Marg electronic tonometer were 22 mmHg in each eye.

Fuchs's corneal dystrophy was diagnosed. The patient was treated with a poly 2-hydroxyethyl

methacrylate Bausch and Lomb U3, plano power continuous wear, soft contact lens with a centre thickness of 0.07 mm and a diameter of 13.5 mm. The lens afforded relief from pain. Increased vascularisation of the left cornea was noted on subsequent visits. The patient often failed to attend regular follow-up appointments. Instead he reported to the clinic when the contact lens had been lost, and his pain had returned.

On 30 April 1981 the patient was examined by a local ophthalmologist. The contact lens had been lost 5 days previously, and the patient reported pain in the left eye. A left corneal epithelial defect with no evidence of an external ocular infection was noted. A new Bausch and Lomb U3, plano power, 0.07 mm center thickness, 13.5 mm diameter soft contact lens was rinsed in sterile, nonpreserved, buffered saline from a new, unopened vial and inserted in the left eye.

The patient was again evaluated at the North Carolina Memorial Hospital eye clinic on 4 May 1981 for complaints of increasing left eye pain, photophobia, tearing, and a purulent discharge. Examination showed a visual acuity of 6/7.5 in the right eye and hand motions in the left eye. The left eye showed moderate conjunctival hyperaemia. Biomicroscopic examination of the left cornea revealed inferior stromal vascularisation, a 4.2 by 1.9 mm central ulcer with an underlying stromal infiltrate, a yellow-white endothelial plaque, and a 2 mm hypopyon (Fig. 1). The contact lens was in place.

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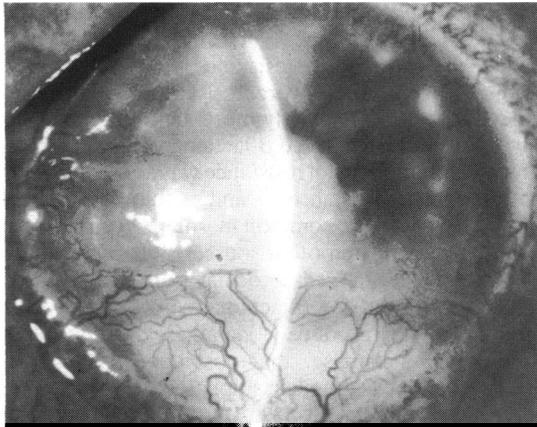


Fig. 1 A central, infiltrated, left corneal ulcer and a hypopyon were present.

The patient was immediately admitted to hospital for diagnostic cultures and treatment. Lid and conjunctival swabs were directly placed and cultured on a sheep blood agar, and corneal scrapings were directly placed and cultured on sheep blood and chocolate agar for routine bacteriological growth. Corneal scrapings were also directly placed and cultured on Sabouraud's agar for routine mycological growth. In addition to scopolamine hydrobromide 0.25% ophthalmic drops every 12 hours, gentamicin sulphate 2%, and cephaloridine 5% ophthalmic drops alternating hourly were instituted in the left eye.

After 24 hours of incubation the lid and conjunctival cultures from both eyes showed bacterial growth that was identified as *Staphylococcus epidermidis*. Corneal scrapings resulted in bacterial growth only on chocolate agar, and the organism was identified as *Haemophilus influenzae*. The *H. influenzae* isolate was found to be susceptible to ampicillin, chloramphenicol, and tetracycline by a modified disc-diffusion method.¹ β -lactamase production was determined on a chromogenic cephalosporin substrate as modified for *H. influenzae*.^{2,3} Serotyping was carried out by the slide agglutination method utilising antisera to *H. influenzae* types a to f inclusive.⁴ Our isolate was nontypeable and did not produce β -lactamase.

Twenty-four hours after admission the corneal ulcer began to improve. Forty-eight hours after admission the cephaloridine drops were discontinued and the gentamicin sulphate drops were decreased in frequency to every 2 hours. On the eighth day in hospital the patient was discharged with a small epithelial defect. He was advised to continue the gentamicin sulphate drops every 2 hours while awake.

Discussion

Members of the genus *Haemophilus* are uncommon causes of corneal ulceration in the modern Western world. Schepens has stated that he was unaware of any serious corneal complications attributable to *Haemophilus* species during 15 years at Moorfields Hospital (London).⁵ This has not always been the case, however. *Haemophilus aegyptius* was described as a cause of conjunctivitis by Koch in 1883, and many reports of corneal complications originated at the turn of the century.⁶ Terlinck in 1905 described a large corneal ulcer with a hypopyon associated with a case of *Haemophilus* conjunctivitis. He proposed that the ulceration was due to a bacterial toxin rather than to direct infection of the cornea.⁷ There are several reports of large, seasonal epidemics of acute haemophilus conjunctivitis associated with a high incidence of corneal complications in North Africa and the Middle East.⁸⁻¹¹ Of 1700 cases of haemophilus conjunctivitis examined by Junès during one epidemic, approximately 12% had corneal complications.⁹ Of these, one out of 3 had a corneal perforation. Sedan *et al.* felt that trachoma, which often occurred concomitantly with these infections, played a role in the pathogenesis of the corneal complications.¹¹

In all previous reports the corneal complications have been judged secondary to a pre-existing conjunctival infection. In fact Feducowicz, speaking of *Haemophilus aegyptius*, stated that primary bacterial keratitis is unknown.¹² There was no evidence of a primary conjunctival infection in our patient. An ophthalmologist saw no evidence of a purulent conjunctivitis when he inserted a contact lens 5 days prior to admission. On admission lid and conjunctival cultures were performed on sheep blood agar. Although *H. influenzae* does not alone grow on sheep blood agar, the bacterium will easily grow as satellite colonies around *Staphylococcus epidermidis*. If *H. influenzae* had been present on the conjunctiva, the bacterium should have been detected as satellite colonies about the *Staph. epidermidis* colonies recovered on the lid and conjunctival culture plate. Therefore our case appears to represent a primary bacterial keratitis.

The new Bausch and Lomb contact lens came from the manufacturer stored in sterile, buffered, non-preserved saline. Although possible, it would seem unlikely that the haemophilus organism could have contaminated that solution, because all sealed, contact lens containers were heat sterilised at 87°C before leaving the manufacturer. Similarly, a new, unopened vial of nonpreserved, buffered saline was used to rinse the contact lens prior to insertion, and these sealed vials were sterilised by filtration through

Table 1 Summary of contact lens related bacterial corneal ulcers

Investigator	Lens	Cases	Organism
Golden <i>et al.</i> ¹⁹	Cosmetic	2	<i>Pseudomonas aeruginosa</i>
Herbst ²⁰	Therapeutic	1	<i>Herellea vaginocola</i>
Dohlman <i>et al.</i> ²¹	Therapeutic	2	<i>Staphylococcus aureus</i> <i>Staphylococcus albus</i>
Ruben ²²	Therapeutic	2	<i>Pseudomonas aeruginosa</i>
Freedman and Sugar ²³	Cosmetic	1	<i>Pseudomonas aeruginosa</i>
Cooper and Constable ²⁴	Aphakic	1	<i>Pseudomonas aeruginosa</i>
	Aphakic	1	<i>Serratia liquifaciens</i>
	Cosmetic	1	<i>Escherichia coli</i>
	Continuous wear	1	<i>Staphylococcus aureus</i>
	Therapeutic	1	<i>Enterobacter aerogenes</i>
Krachmer and Purcell ²⁵	Cosmetic	4	<i>Pseudomonas aeruginosa</i> <i>Escherichia coli</i>
Lass <i>et al.</i> ²⁶	Therapeutic	3	<i>Serratia marcescens</i>
	Aphakic	1	<i>Serratia marcescens</i>
Eichenbaum <i>et al.</i> ²⁷	Aphakic	1	<i>Pseudomonas aeruginosa</i>
		1	<i>Staphylococcus epidermidis</i>
		1	<i>Serratia marcescens</i>

a 0.22 μm Millipore filter before leaving the manufacturer. However, once the new contact lens was removed from its container and rinsed in the saline, haemophilus contamination of the contact lens could have occurred and infected the eye at the time of insertion. A corneal epithelial erosion may have occurred or been present, and the contact lens could have provided the appropriate environment for growth of the haemophilus organism.

We make no attempt to distinguish between *H. influenzae* and *H. aegyptius*, known as Kock-Weeks bacillus in the older literature. For decades the status of *H. aegyptius* has been disputed; some investigators have argued for a separate species while others see no basis for such a distinction. The most widely accepted view is that *H. aegyptius* is *H. influenzae* biotype 3.^{13 14} Only recently have sophisticated tests been available to classify such biotypes with confidence. The isolation of a *Haemophilus* species from an eye culture is not sufficient basis for further classifying the organism as *H. influenzae* biotype 3.

Our *H. influenzae* isolated was nontypeable. In children nontypeable *H. influenzae* is a defined cause of otitis media. However, until recently the pathogenicity in adults of nontypeable *H. influenzae* has not been well established.¹⁵ Two recent articles have shown nontype b and nontypeable isolates to be more common than type b isolates in a variety of adult *H. influenzae* infections.^{16 17}

Over the last several years there has been a definite change in the antibiotic sensitivities of *H. influenzae*.

A significant increase in resistance to ampicillin and chloramphenicol has been noted. In a survey of *H. influenzae* antibiotic resistance in the United Kingdom 115 strains were resistant to ampicillin; resistance was significantly more common in type b strains, and 106 produced β -lactamase.¹⁸ In the same study chloramphenicol resistance was associated with tetracycline resistance, and chloramphenicol resistance was more common in isolates from the eye than in isolates from other sources.¹⁸ These findings suggest that *H. influenzae* ocular isolates should be typed and tested for β -lactamase production. Our isolate did not produce β -lactamase. If an isolate produces β -lactamase, the most appropriate antibiotic would be gentamicin sulphate.

Bacterial corneal ulcers are a recognised complication of soft contact lens wear, and *H. influenzae* to our knowledge has never been identified as the aetiological agent of this disease. Table 1, a compilation of cases of soft contact lens-related bacterial keratitis, includes cases associated with both cosmetic and therapeutic soft lenses. Although most of the bacteria previously reported are known potential corneal pathogens, other distinctly unusual bacteria such as *Herellea vaginocola* (*Acinetobacter calcoaceticus*) have been identified as the pathogens in corneal ulcers related to therapeutic contact lens wear. It may be that the addition of a therapeutic contact lens to a cornea with pre-existing abnormalities, such as chronic epithelial defects and stromal vascularisation, alters the microenvironment of the corneal surface sufficiently to widen the range of susceptibility to corneal pathogens. Because bacteria not generally considered corneal pathogens can cause infectious corneal ulcers secondary to contact lens wear, the clinician should give special attention to organism identification in contact lens patients with corneal ulcers so that appropriate therapy can be administered.

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