*Case report*

# Post-operative ocular infection due to *Streptococcus dysgalactiae* subspecies *equisimilis*

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**Abstract**

Ocular infections due to *Streptococcus dysgalactiae* subsp. *equisimilis* are rare. In the present report, three patients with a history of uncomplicated small incision cataract surgery with intraocular lens implantation developed exogenous endophthalmitis due to *Streptococcus dysgalactiae* subsp. *equisimilis.* The identification of the organisms was confirmed by PCR for a 16S rRNA sequence specific to the species *S. dysgalactiae*. Intravitreal treatment of cefazolin and amikacin, in addition to topical ofloxacin and tobramycin, resulted in resolution of infection in all three patients. Our reports indicate the importance of bacterial culture and molecular identification in the diagnosis of *S. dysgalactiae* subsp. *equisimilis* infection in the eye.

**Key words:** *Streptococcus dysgalactiae* subsp. *Equisimilis*; endophthalmitis; PCR; group G *Streptococcus*

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## Introduction

*Streptococcus dysgalactiae* subsp. *equisimilis* (group G beta-haemolytic streptococcus [GGS]) commonly inhabits the throat, skin, and vagina of healthy humans [1]. However, occasionally, the organism can cause pharyngitis, impetigo, cellulitis, septicemia, glomerulonephritis, and toxic shock [1]. The same disease spectrum generally coincides with that of a well-known human pathogen, the group A beta-haemolytic Streptococcus (GAS; *Streptococcus pyogenes*) which cohabits the same tissue sites. Due to the extensive overlap of the disease spectrum of GGS with GAS, it is possible that disease burden specifically attributed to GGS has been historically underestimated. Recent reports suggest an increase of GGS infections associated with classic human GAS-associated diseases, including invasive manifestations [2,3]. Phylogenetic analyses based on rRNA sequences and other molecular clocks have revealed that *Streptococcus dysgalactiae* spp. are closely related to *S. pyogenes* [4]. However, there have hitherto been only a few case reports describing ocular infection due to *Streptococcus dysgalactiae* subsp. *equisimilis* [5,6]. In the present report, ocular infection due to *Streptococcus dysgalactiae* subsp. *equisimilis* is described in three immunocompetent patients following ocular surgery.

## Case reports

Three patients (a 50-year-old female, a 75-year-old male, and a 62-year-old male) all had a history of uncomplicated small incision cataract surgery with posterior chamber intraocular lens implantation in one eye. All three patients had been operated on the same day at the same surgical session in the same operating room and by the same surgeon. They did not receive immunosuppressive therapy, had no history of intravenous drug abuse, and were not alcoholics. There was no past history of diabetes mellitus or tuberculosis and no history of systemic infections on the day of surgery. All three patients developed pain and reduced vision in the operated eye within a week after surgery. At presentation, there were no signs and symptoms of infection in the unoperated eyes (pseudophakia in two patients). However, the operated eyes were inflamed with a dense peripheral corneal infiltrate and exudates in the anterior chamber and behind the intraocular lens. There was no view of the fundus and visual acuity was hand movements only. Ultrasound B scan revealed the presence of dense vitreous infiltrates with multiple cavities. The patients received intravitreal cefazolin 2.25 mg / 0.1 ml and amikacin 0.4 mg / 0.1 ml, in addition to topical ofloxacin (0.3%) and tobramycin (0.3%). Vitreous material obtained from the inflamed eyes at the time of the intravitreal injection was

subjected to detailed microbiological investigations. Following treatment, the corneal infiltrate decreased and exudates in the anterior chamber were also reduced. The patients were discharged on topical medications and asked to attend regular follow-up.

## Microbiological investigations

Vitreous aspirates from the patients' infected eyes were processed aseptically for microbiological culture and direct microscopy. The samples were inoculated onto various culture media, including sheep blood agar, brain heart infusion agar and broth, and Sabouraud's dextrose agar and broth. The culture plates were incubated appropriately. Smears were prepared from the vitreous aspirates for Gram staining and also for lactophenol cotton blue mount. Microbiological surveillance of the operation room was performed to determine the possible source of the infection. For this purpose, throat swabs were obtained from the operation theatre personnel (two ophthalmologists, two surgical nurses, two floor nurses, and one assistant) who had been involved in the surgical procedures.

After microbiological investigations (culture), the organism was confirmed by PCR for a 401 bp sequence of the 16S rRNA specific to the species *S. dysgalactiae* [7] and for a 601 bp sequence of the streptokinase precursor gene specific to human isolates of *Streptococcus dysgalactiae* subspecies *equisimilis* [8] (H46skc-F: 5'-GGTACTGTTGAGGGGACGAA-3' and H46skc-R: 5'-CGATTGAGGAGTCACGTTCA-3'). The DNA was extracted from one loopful of a pure streptococcal culture by lysozyme/proteinase K digestion [9]. The PCR mixture contained 2 µl of the template (microbial) DNA, 10 pmol of each primer, 25 µl of Taq PCR mastermix (Qiagen GmbH, Hilden, Germany) and water up to 50 µl total volume. The PCR programme was as follows: 94°C for 3 minutes; 35 cycles at 94°C for 30 seconds, at 57°C for 30 seconds, and at 72°C for 40 seconds; followed by a final extension at 72°C for 7 minutes. Ten microliters of the reaction products were visualised by electrophoresis in 2.0% agarose gel containing 0.5 mg/ml of ethidium bromide with Tris-borate–EDTA buffer (TBE; 89mM Tris, 89mM boric acid, 2mM EDTA, pH 8.3).

## Results and discussion

Gram-stained smears of the vitreous fluid samples revealed numerous Gram-positive cocci in pairs and short chains; culture of these samples grew beta-haemolytic streptococci provisionally identified as *Streptococcus dysgalactiae* subsp. *equisimilis* by biochemical methods. Association of group G *Streptococcus* with endophthalmitis is well-established. Previously, such infection has been reported following cataract surgery, penetrating keratoplasty and trabeculectomy [10]. In addition, nine cases of endogenous Lancefield Group G beta-haemolytic Streptococcus (GGS)-related endophthalmitis have been published so far. Of them, five cases were associated with endocarditis, one each with cellulitis of the foot, facial trauma, abscessed tooth and of unknown origin [6,11-13]. An additional study also indicates the involvement of this organism in bilateral endogenous endophthalmitis [14].

Due to the susceptibility pattern of the organism, various options are available to treat GGS related endoopthalmitis. In 1983, Ramasamy *et al.* [5] reported two cases of *Streptococcus equisimilis* ophthalmic infection, one with endophthalmitis and the other with purulent conjunctivitis; the endophthalmitis responded well to intravenous penicillin G and topical chloramphenicol while the purulent conjunctivitis resolved with Neosporin eye drops and vitamin supplements [5]. Recently, Suemori *et al.* [6] reported one case of *Streptococcus equisimilis* endogenous endophthalmitis whose general condition and ophthalmic inflammation improved following emergency mitral valvuloplasty, intravitreal and subconjunctival vancomycin and meropenem, topical levofloxacin and ofloxacin, and intravenous gentamicin and penicillin G; however, the best-corrected visual acuity remained at light perception. In the present report, intravitreal administration of cefazolin and amikacin with the topical application of ofloxacin and tobramycin resulted in resolution of the infection in all the patients. The use of intravitreal antibiotics to treat GGS-related endogenous endophthalmitis is still controversial [11]. Further research on this aspect would facilitate successful treatment and outcome.

In this study, surveillance investigations showed the presence of *Streptococcus dysgalactiae* subsp. *equisimilis* in a throat swab sample collected from a 35-year-old healthy nurse who had assisted at the three surgeries. The nurse did not have a history of systemic infection and had no signs of upper respiratory tract infection or other diseases. The observation indicates the importance of infection control practices in hospital settings to avoid nosocomial infections; otherwise, the organisms may be transmitted from patients or the nursing staff or may originate from the hospital environment (exogenous infection). In the case of poor hygienic conditions, infection may be derived from the patient's own flora (endogenous infection). In either case, surgical procedures,

instrumental manipulation, or nursing procedures play important roles in the spread of nosocomial infection. The situation can be worse in cases of surgical site infections that account for 14%-16% of all nosocomial infections [15]. In the present study, the surveillance results suggest that the nurse may have been a healthy carrier who directly transmitted the infection. The infection may also have been transmitted during surgery.

Epidemiology of *Streptococcus dysgalactiae* subsp. *equisimilis* is probably underestimated, and antibiotic treatment is often chosen by physicians without bacterial identification. However, due to its potential to spread in nosocomial settings, emergence of antibiotic resistance in these strains can be expected. Therefore, it is important to confirm the identification by bacterial culture and PCR and conduct an antibiotic susceptibility profile, especially for the strains isolated from the eye. Lab diagnostic procedures not only help to better investigate the spread and pathogenic potential of *S. dysgalactiae* subsp. *Equisimilis* but to evaluate the risk of nosocomial infections due to asymptomatic carriers.

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