Acute postoperative endophthalmitis caused by

*Staphylococcus lugdunensis*

C. CHIQUET, A. PECHINOT, C. CREUZOT-GARCHER, Y. BENITO,
J. CROIZE, S. BOISSET, J.P. ROMANET, G. LINA, F. VANDENESCH

for the FRIENDS group (French Institutional Endophthalmitis Study group)

1 Department of Ophthalmology, CHU de Grenoble, Faculté de Médecine, Université Joseph Fourier, Grenoble, France
2 Department of Microbiology, CHU de Dijon, Dijon University, Dijon, France
3 Department of Ophthalmology, CHU de Dijon, Dijon University, Dijon, France
4 Université de Lyon, Lyon, F-69003, France ; université Lyon 1, faculté de médecine Laennec, Lyon, F-69003, France ; Hospices Civils de Lyon, Laboratoire de Bactériologie, Hôpital Louis Pradel, Bron, F-69677, France
5 Department of Microbiology, CHU de Grenoble, Faculté de Médecine, Université Joseph Fourier, Grenoble, France
6 Université de Lyon, Lyon, F-69003, France ; université Lyon 1, faculté de médecine Laennec, Lyon, F-69003, France ; Hospices Civils de Lyon, Laboratoire de Bactériologie, Hôpital Edouard Herriot, Lyon, F-69003, France
Running title: Post-operative endophthalmitis caused by *S. lugdunensis*

Corresponding author:
Christophe CHIQUET, MD, PhD

Department of Ophthalmology

CHU de GRENOBLE

38043 Grenoble cedex 09

France

Tel: +33 476 765548

Fax: +33 476 767570

✉ cchiquet@chu-grenoble.fr
Abstract

Acute postoperative endophthalmitis caused by *Staphylococcus lugdunensis* is infrequently reported in clinical studies. Five cases of acute postcataract surgery endophthalmitis caused by *S. lugdunensis* were taken from a multicenter prospective study conducted in four university-affiliated hospitals in France (2004–2005). These cases were characterized by severe ocular inflammation occurring with a mean delay of 7.6 days after cataract surgery, severe visual loss (hand motions or less in three cases), and dense infiltration of the vitreous. Each of these patients was initially treated using a standard protocol with intravitreal (vancomycin, ceftazidime), systemic and topical antibiotics. Given the severity of the endophthalmitis, even though bacteria was sensitive to intravitreal antibiotics, pars plana vitrectomy was needed in four cases. The final visual prognosis was complicated by severe retinal detachment in three cases. The microbiological diagnosis was reached using conventional cultures with specific biochemical tests and eubacterial PCR amplification followed by direct sequencing.
INTRODUCTION

Bacterial endophthalmitis, with an estimated incidence following cataract surgery between 0.07% and 0.3% (5, 12), is among the most feared complications of intraocular surgery and may result in severe vision loss (1, 5, 15, 16). In studies based on conventional culture techniques, coagulase-negative staphylococci (e.g., Staphylococcus epidermidis) account for nearly 60% of all cases and Staphylococcus aureus for another 20% of the total. S. lugdunensis is known to be an aggressive coagulase-negative Staphylococcus and has been infrequently described as a cause of endophthalmitis (5.9% of all coagulase-negative staphylococci, CNS) (2).

We present five cases of endophthalmitis due to S. Lugdunensis, among a large series of 126 postoperative endophthalmitis included in a multicenter prospective study conducted in four university-affiliated hospitals in France (2004–2005). Ocular sampling were obtained before and after intravitreal injection of antibiotics, from the aqueous humor and/or the vitreous. The aim of this study was to describe the clinical characteristics of endophthalmitis caused by S. lugdunensis more precisely and to report the usefulness of eubacterial PCR in the microbiological diagnosis.

CASE REPORTS

CASE 1

This 82-year-old patient underwent cataract extraction (phakoemulsification) and intraocular lens implantation in the anterior segment of his left eye, complicated by a capsular lens rupture and vitreous loss. The first symptoms were present 7 days after surgery (loss of visual acuity, red eye) and the patient was admitted to the hospital 2 days later. Slit lamp examination (Table 1) disclosed a severe intraocular
inflammation in both the anterior and the posterior segments. The patient was treated with two intravitreal injections of antibiotics [vancomycin 1 mg and ceftazidime 2.25 mg as a standardized protocol] and vitrectomy. *S. lugdunensis* was isolated from the culture of the initial aqueous humor sample and was identified using eubacterial PCR on vitreous samples (from pars plana vitrectomy performed after two intravitreal injections of antibiotics, Table 1). Given these results, the systemic and intravitreal antibiotic therapy was not modified. After 6 months, the anterior chamber and the posterior segment of the eye showed no inflammatory activity and visual acuity had improved to 20/40. The examination of the fundus showed a tiny macular epiretinal membrane.

**CASE 2**

An 84-year-old patient presented with acute visual loss and intraocular inflammation of the left eye (Table 1) 6 days after cataract surgery complicated by a capsular lens rupture. Before treatment, cultures and PCR performed on aqueous humor and vitreous samples identified *S. Lugdunensis* (Table 1). A pars plana vitrectomy was performed 7 days after admission and cultures were negative (PCR was not performed at this time, since the amount of the vitreous specimen was insufficient for both techniques). The vitrectomy was complicated by a retinal detachment 10 days later, which required an additional vitreoretinal surgery (vitrectomy, cryopexy, silicone). At the 18-month follow-up visit, visual acuity was limited to hand motions and there was no inflammatory activity in the eye, although the retina was attached (after removal of silicone oil).

**CASE 3**

A 78-year-old man underwent uncomplicated cataract surgery and was admitted 5 days later with a clinical picture of acute endophthalmitis in his right eye (Table 1).
Ocular examination revealed visual acuity of light perception, evidence of intraocular inflammation, and no fundal view. Ultrasound examination at this stage revealed a dense vitreous without retinal or choroidal detachment. Cultures and eubacterial PCR of these initial vitreous samples were positive at this time for *S. Lugdunensis* [Table 1]. A pars plana vitrectomy was performed 4 days later and undiluted vitreous was sterile on cultures, whereas PCR was positive. Endophthalmitis was complicated by retinal detachment 10 days after vitrectomy. The patient underwent an additional vitreoretinal surgery (using silicone oil) but the final prognosis at 6 months was phthisis and absence of vision.

**CASE 4**

A 69-year-old woman suffered from pain, redness, and an acute loss of visual acuity 12 days after uncomplicated cataract surgery on the right eye. This patient had systemic hypertension and cardiac failure. On admission, ocular examination revealed visual acuity of 20/100 as well as severe inflammation of the anterior chamber and the vitreous. The patient underwent a vitreous tap at the time of the second intravitreal injection and both bacterial cultures and eubacterial PCR were positive for *S. lugdunensis*. This ocular sample was taken 2 days after the first intravitreal injection of antibiotics. Since the clinical presentation improved after two intravitreal injections of antibiotics, a pars plana vitrectomy was not necessary. The final prognosis was excellent with a visual acuity of 20/20 at the 1.5-year follow-up; no anatomical sequelae were noted.

**CASE 5**

A 64-year-old man was operated on for cataract extraction and intraocular lens implantation in the right eye without complication and suffered from acute visual loss
without pain 7 days after surgery. The diagnosis of acute postoperative endophthalmitis was evident (Table 1). The patient benefitted from 2 intravitreal injections of antibiotics since the anterior segment was better (clear cornea, absence of tyndall, retraction of the cyclitic membrane). However, the vitreitis did not reduce (based on ultrasound imaging). Ocular sampling consisted of two vitreous taps at the time of intravitreal injections of antibiotics. Only the first vitreous tap was positive on culture and PCR for *S. Lugdunensis*. Other ocular samples (at the time of second intravitreal injection and vitrectomy) were negative. The patient was operated on for pars plana vitrectomy. Visualization of the fundus during surgery showed a pale retina of the posterior pole, without retinal hemorrhage. A retinal detachment with a giant retinal tear occurred 15 days after the pars plana vitrectomy and required a second vitreoretinal surgery (peeling of epiretinal membranes, endolaser, silicone oil). Six months after this surgery, visual acuity was limited to “counting fingers” and the retina remained attached under silicone oil.

For all strains, the minima inhibitory concentrations were as follows: norfloxacin and ofloxacin 0.5 mg/l, fosfomycin < 8 mg/l, vancomycin < 1 mg/l, teicoplanin < 0.5 mg/l, amikacin < 4 mg/l, cefalotin < 8 mg/l, oxacillin < 0.25 mg/l.

**MATERIAL AND METHODS**

These five cases of acute postoperative endophthalmitis caused by *Staphylococcus lugdunensis* were part of a multicenter prospective study conducted in four university-affiliated hospitals in France (2004–2005) investigating 126 patients with postoperative endophthalmitis. This prospective study aimed to evaluate eubacterial techniques associated with conventional cultures for the microbiological
diagnosis of endophthalmitis. This study adhered to the Declaration of Helsinki for research guidelines involving human subjects. Patients did not have a systemic risk factor for endophthalmitis, such as diabetes, steroid medication, or immunosuppression.

At admission, all patients underwent an immediate tap of the aqueous humor followed by intravitreal injection of vancomycin (1 mg) and ceftazidime (2.25 mg). Patients were also initially treated with a broad-spectrum intravenous antibiotic regimen (fluoroquinolone and piperacillin) for 5 days, topical drugs (corticosteroid, tropicamide), and fortified drops (vancomycin, ceftazidime). All eyes were sampled after topical anesthesia and instillation of 5% aqueous povidone iodine solution in the conjunctival sac. After the lid speculum was in place, a new instillation of povidone iodine solution was given. Then the conjunctival sac was washed with 20 ml of sterile balance salt solution before sampling. Aqueous humor samples (200 µl) were collected just before the first intravitreal injection in a sterile syringe immediately after paracentesis in the anterior chamber, then transferred in an aliquot.

When necessary, pars plana vitrectomy was performed and undiluted vitreous samples (500 µl) were also collected. Pars plana vitrectomy was considered in case of initial severe clinical presentation (visual acuity less than count fingers, dense opacities in the vitreous cavity, other complications such as a retinal detachment or posterior dislocation of the lens) or if there was an anatomic and/or functional aggravation after the first injection of antibiotics. The transfer processing was similar to that of aqueous humor sampling. Aqueous and vitreous specimens were divided in half at the time of sampling under aseptic conditions: one half (100–250 µl) in Brain Heart Infusion broth (10 ml, pH 7.4 ± 0.2, ref. ADM 88440, AES Laboratories,
Combourg, France) and the other half (100–250 µl) in a microcentrifuge tube for PCR.

Culture. After culture of the biological sample in Brain Heart Infusion broth, Staphylococcus strains were isolated on blood agar plates (bioMérieux, Marcy l’Etoile, France) at 37°C in aerobic conditions for 24 h. Strains were then identified as Staphylococcus lugdunensis with ID32 STAPH strips (bioMérieux)(13). The ID32 STAPH strips used in this study include 26 tests, in particular the detection of ornithine decarboxylase and pyrrolidonyl arylamidase. At least, the positivity of these tests are necessary to identify the bacteria as a S. lugdunensis. The antibiogram was performed using the Vitek II Gram-Positive Susceptibility cards (AST P 531; bioMérieux). The β-lactamase production was deduced if minimum inhibitory concentrations (MIC) > 0.5 mg/l using the Vitek II Gram-positive Susceptibility cards and if MIC < 0.5 mg/l, the β-lactamase production was studied using the nitrocefin test. DNA extraction. All DNA extraction procedures were carried out in a class II biological safety cabinet (Faster, Ferrara, Italy) in a room physically separated from the room used to prepare all PCR reagents except DNA and also from the room used to prepare nucleic acid amplification mixes, and finally from the room used for post-PCR analysis. DNA was extracted from ocular samples (aqueous humor, vitreous) with the High Pure PCR Template Preparation Kit (Roche Diagnostics, Meylan, France) according to the manufacturer’s recommendations. An extraction negative control composed of all reagents used for DNA extraction minus the ocular sample was processed in parallel with each sample. Amplification of the human betaglobulin gene served as an internal positive extraction control (8).
PCR assay. The oligonucleotide primers designed for the 16S rDNA PCR were 91E (5′TCAAA[G,T]GAATTGACGGGGGC3′) and 13BS (5′GCCCGGGGAACGTATTAC3′), which produced a 492-bp fragment of 16S ribosomal DNA (18). Primers PC04 (5′CAACTTCATCCACGTCACC3′) and GH20 (5′GAAGAGCCAAGGACGACACC3′) were used to amplify a 268-bp fragment of the human betaglobin gene. The PCR mixture, which was made up to 50 µl with sterile water (Sigma), contained 1x PCR buffer, MgCl₂ (2.5 mM), 200 µM each deoxynucleoside triphosphate (including dUTP at a dUTP/dTTP ratio of 1:9), 200 µM of each primer, 2.5 U of Taq DNA polymerase (Roche Diagnostics), and 1 U of heat-labile uracil DNA-glycosylase (UNG; Roche Diagnostics) to prevent carryover contamination between PCRs. Five microliters of DNA extract was added to the PCR mixture, which was incubated for 10 min at 20°C for U-DNA cleavage by UNG, followed by UNG inactivation by incubation at 94°C for 10 min. PCR was performed for 32 cycles (denaturation for 30 s at 94°C, annealing for 30 s at 58°C, and extension for 30 s at 72°C) with a Biometra thermocycler, followed by 10 min of incubation at 72°C.

PCR products were analyzed by electrophoresis through a 1.5% agarose gel (Sigma) and sequenced with PCR primer 13BS on an automated sequencer made by Biofidal (Vaulx en Velin, France).

The 16S rDNA sequences obtained were compared with those available in the GenBank, EMBL, and DDBJ databases with the BIBI program (Bio Informatic Bacterial Identification; http://pbil.univ-lyon1.fr/bibi/query.php). Identification to the species level was defined as a 16S rDNA sequence similarity of 99% or greater with that of the GenBank prototype strain sequence; identification to the genus level was defined as a 16S rDNA sequence similarity of 97% or greater with that of the
GenBank prototype strain sequence. A failure to identify was defined as a 16S rDNA sequence similarity of less than 97% with sequences deposited in GenBank at the time of the analysis (3). Results of PCR were available in 3 days after sampling.

To assess the sensitivity of the detection series, 10-fold dilutions were made from 24-h culture colonies of *Staphylococcus epidermidis*. Equal aliquots were cultured for colony count and DNA extraction plus PCR amplification. The detection sensitivity was 500–1000 organisms. As a control, aqueous humor samples from eyes having undergone cataract surgery (*n* = 15) or retinal detachment surgery (*n* = 15) and vitreous samples from eyes having undergone pars plana vitrectomy (epiretinal membrane, *n* = 5, diagnostic vitrectomy, *n* = 5) were obtained in the same sterile conditions. The control samples were analyzed using the same techniques as infectious specimens and PCR was negative in all cases.

**DISCUSSION**

While coagulase-negative staphylococci (CNS) are the most common infecting organisms in postoperative endophthalmitis, *S. lugdunensis* is rarely reported as a causative bacterial agent (2). The five cases described in the present report belong to a large series of postoperative endophthalmitis patients included in a multicenter prospective study in France (*n* = 126, 2004–2005, FRIENDS group). Among 87 bacteriologically documented cases (69%) using eubacterial PCR and/or conventional cultures, *S. lugdunensis* accounted for 5.7% of the bacterial spectrum and 10% from all staphylococci (*n* = 50). Whereas *S. lugdunensis* was first described in 1988 (7), the low frequency of *S. lugdunensis* in endophthalmitis was first reported in the Endophthalmitis Vitrectomy Study in 1997 (2), which observed a 47.7%
frequency of CNS species (from \( n = 250 \) intraocular bacterial isolates) in aqueous humor and vitreous samples. Among the CNS cases, \( S. \) epidermidis accounted for 81.9\% and \( S. \) lugdunensis was isolated in 5.9\% of the CNS cases \((n = 9)\) and 3.6\% of all isolates \((9/250)\). \( S. \) lugdunensis was isolated from the aqueous humor in only one case, vitreous only in four cases, and in both specimens in four cases. Furthermore, this previous study showed that for this pathogen, eyelid isolates were found to be indistinguishable from intraocular isolates. Given its isolation from the intraocular compartments of patients with endophthalmitis, and the 100\% correlation of eyelid versus vitreous association shown by pulsed-field gel electrophoresis \( (2) \), \( S. \) lugdunensis was considered a significant opportunistic pathogen. However, the clinical course of these patients was not described in the Bannerman study and alternative identification techniques such as eubacterial PCR were not used at this time.

\( S. \) lugdunensis has been isolated mostly as a causative agent of skin and soft-tissue infections \( (6, 7, 10) \). In recent years, this pathogen has been reported to cause a wide variety of more serious infections, including brain abscess, meningitis, sepsis, chronic osteomyelitis, spondylodiscitis, and endocarditis \( (6, 7, 10, 21) \). The clinical course of infections caused by \( S. \) lugdunensis is known to resemble the course of \( S. \) aureus infections \( (10, 21) \). These organisms are also frequently misidentified as \( S. \) aureus because of their morphologic appearance with yellow pigmentation, complete hemolysis when cultured on blood agar, and positive results in tests for clumping factor \( (17) \).

In this report, the pathogen \( S. \) lugdunensis was identified in all cases from ocular samples by using cultures associated with biochemical tests and eubacterial
PCR amplification followed by direct sequencing. In routine laboratory testing, *S. lugdunensis* is most often confused with *S. aureus* or with other CNS (6, 7, 9). Most laboratories use commercial systems that are based on biochemical reactions. However, some commercial identification kits provide unreliable results for CNS species, particularly for non-*S epidermidis* isolates, as a result of the variability of diagnostic reactions within species and the subjective nature of their interpretation (4, 14). The ID32 STAPH strips used in this study include 26 tests, in particular the ornithine decarboxylase, the pyrrolidonyl arylamidase phenotypic tests. At least, the positivity of these tests are necessary to identify the bacteria as a *S. lugdunensis*.  

As seen in Table 1, the susceptibility data from these cases demonstrate that *S. lugdunensis* is usually susceptible to antibiotics commonly used via the intravitreal route. Only penicillin G was often resistant with production of B lactamase (24% B lactamase-positive in a article by Herchline et al.) (11). This report highlights the usefulness of molecular methods to quickly detect the presence of bacteria, particularly when a small ocular sample (aqueous humor) is available. In a previous study (personal communication, Association for Research in Vision and Ophthalmology, Fort Lauderdale, USA, 2004), we showed that PCR analysis performed on aqueous humor samples (before treatment) could lead to a 65% microbiologic identification rate when used in association with cultures. The effectiveness of aqueous humor samples for both cultures and PCR is of interest since these samples can be easily and rapidly obtained (they are painless and feasible after local anesthesia). Furthermore, PCR techniques are particularly useful when patients have been previously treated with systemic and intravitreal antibiotics, as suggested by the positive PCR observed in the vitreous samples of two patients (#1, #3) taken during vitrectomy after intravitreal injections. In patient #2, the ocular
sample was taken after the first intravitreal injection of antibiotics and was positive for
*S. lugdunensis* both in culture and PCR. This is consistent with a previous report
showing that a single injection of intravitreal antimicrobial agents may be insufficient
to eradicate the bacteria from the eye (20). Furthermore, the previous use of
intravitreal antibiotics does not seem to affect the ability to PCR-amplify DNA in the
short term for *S. lugdunensis*. In the case #1, the negativity of the PCR associated
with positive cultures suggests a lack of sensitivity of the molecular technique. It is
likely that a *Staphylococcus*-specific PCR would have been much more sensitive (4,
19); however for the purpose of clinical diagnosis where a large diversity of causative
bacteria can be involved, eubacterial PCR remains the most cost-effective technique.
In the second case (#5), the negativity of both cultures and PCR in vitreous from
vitrectomy suggests that the two previous injections of antibiotics lead to an
eradication of the bacterial load. Data from the literature on endocarditis and other
tissue infection caused by *S. lugdunensis* emphasize the aggressive nature of the
organism and the importance of identifying coagulase-negative staphylococci to the
species level. Identification of *S. lugdunensis* in ocular specimens is highly
recommended, as the initial presentation was severe in three out of the five cases of
this series (Table 1). The clinical course of infections depends on the virulence of the
organism, the delay from symptoms to treatment, and the therapeutic protocol. In our
cases, pars plana vitrectomy was needed in three out of the four cases since visual
acuity was low (light perception) and inflammation of the eye was severe. After
conventional cultures and eubacterial PCR in 100 patients with acute post cataract
endophthalmitis (a part of our prospective and multicenter study in 2004-2005), 33
CNS, 5 *S. Lugdunensis* and 6 *S. Aureus* were identified. When compared with
patients with other coagulase-negative staphylococci, patients infected with *S.
Lugdunensis were characterized by a worse final functional prognosis (at 6 months, \( p = 0.07 \)) and a higher frequency of post-vitrectomy retinal detachment (60% vs 3%, \( p = 0.05 \)). The aggressive nature of *S. lugdunensis* may be related to the production of extracellular slime or glycocalyx, which has a role in bacterial colonization and interferes with the phagocytosis-associated activities of neutrophils and the production of enzymes (esterase, fatty-acid modifying enzymes, protease, and lipase) (22). The final prognosis was associated with the occurrence of a retinal detachment in 3 of 5 patients, after vitrectomy, which is known to be anatomically and functionally severe. The high rate of retinal detachment could be related to the virulence of the *S. Lugdunensis* causing retinal lesions (such as necrosis) not only on the posterior pole but also on the peripheral retina (causing retinal breaks). These data suggest that prompt and precise identification of the organism *S. lugdunensis* is extremely important so that the appropriate treatment be administered for a successful outcome.

In conclusion, this case series of endophthalmitis caused by *S. lugdunensis* shows that the microbiological diagnosis can be carried out by conventional microbiological cultures and by eubacterial PCR. The correct identification of this species by molecular method only in some of the ocular samples emphasizes the clinical benefit of molecular methods. Given the severe presentation of eyes with endophthalmitis caused by *S. lugdunensis*, an appropriate and a rational therapy is of value and necessitates an accurate bacterial identification. Early pars plana vitrectomy is often needed in these cases to allow a useful final visual recovery.
REFERENCES


**Table 1: Clinical features and microbial identification of endophthalmitis caused by *Staphylococcus lugdunensis*.

<table>
<thead>
<tr>
<th></th>
<th>Patient #1</th>
<th>Patient #2</th>
<th>Patient #3</th>
<th>Patient #4</th>
<th>Patient #5</th>
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<tbody>
<tr>
<td><strong>Surgery</strong></td>
<td>Cataract extraction</td>
<td>Cataract extraction</td>
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<td>Cataract extraction</td>
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<tr>
<td></td>
<td>Capsular lens rupture</td>
<td>Capsular lens rupture, vitreous loss</td>
<td>IOL in the bag</td>
<td>IOL in the bag</td>
<td>IOL in the bag</td>
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<tr>
<td></td>
<td>Anterior IOL</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Delay from surgery (days)</strong></td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>12</td>
<td>7</td>
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<tr>
<td><strong>Initial visual acuity</strong></td>
<td>Hand motion</td>
<td>Light perceptions</td>
<td>Light perceptions</td>
<td>20/100</td>
<td>Hand motion</td>
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<tr>
<td><strong>Anterior chamber</strong></td>
<td></td>
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<tr>
<td>Con junctival hyperemia</td>
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<td>Con junctival hyperemia</td>
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<td>Con junctival hyperemia</td>
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<tr>
<td>Tyndall ++</td>
<td></td>
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<td></td>
<td>Tyndall ++</td>
<td>Con junctival hyperemia</td>
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<tr>
<td>Hypopion 1.5 mm</td>
<td></td>
<td></td>
<td></td>
<td>Hypopion 1 mm</td>
<td>Cyclitic membrane</td>
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<tr>
<td><strong>Posterior chamber</strong></td>
<td>Loss of red reflex</td>
<td>Red reflex +</td>
<td>Loss of red reflex</td>
<td>Red reflex +</td>
<td>Red reflex +</td>
</tr>
<tr>
<td>Vitreitis +++</td>
<td></td>
<td>Red reflex +</td>
<td>Red reflex +</td>
<td>Retinal details not visualized</td>
<td>Retinal details not visualized</td>
</tr>
<tr>
<td>Retina not visualized</td>
<td></td>
<td>Retinal details not visualized</td>
<td>Red reflex +</td>
<td>Retinal details not visualized</td>
<td>Retinal details not visualized</td>
</tr>
<tr>
<td><strong>Cultures</strong></td>
<td>+ in AH</td>
<td>+ in AH and vitreous (tap)</td>
<td>+ in vitreous (tap)</td>
<td>+ in vitreous (tap)</td>
<td>+ in vitreous (tap)</td>
</tr>
<tr>
<td></td>
<td>- in vitreous from PPV at day 7</td>
<td>- in vitreous from PPV at day 4</td>
<td>+ in vitreous from PPV at day 4</td>
<td>- in vitreous from PPV at day 5</td>
<td>+ in vitreous (tap)</td>
</tr>
<tr>
<td><strong>Eubacterial PCR</strong></td>
<td>- in AH</td>
<td>+ in AH and vitreous tap (99%)</td>
<td>+ in vitreous tap (99%)</td>
<td>+ in vitreous tap (99%)</td>
<td>+ in vitreous tap (100%)</td>
</tr>
<tr>
<td>(% sequence identity with S. lugdunensis)</td>
<td>+ in vitreous from PPV (100%) at day 5</td>
<td>+ in vitreous from PPV (99%) at day 4</td>
<td>+ in vitreous from PPV (99%) at day 4</td>
<td>+ in vitreous from PPV (100%) at day 4</td>
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<td>- in vitreous from PPV (99%) at day 4</td>
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<td>- in vitreous from PPV (100%) at day 4</td>
<td>- in vitreous from PPV (100%) at day 4</td>
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<tr>
<td><strong>Treatment</strong></td>
<td>3 intravitreal injections PPV at day 5</td>
<td>2 intravitreal injections and PPV at day 7 and day 17</td>
<td>2 intravitreal injections PPV at day 4</td>
<td>2 intravitreal injections No PPV</td>
<td>2 intravitreal injections and PPV at day 5</td>
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<tr>
<td>Final prognosis</td>
<td>VA 20/40 at 6-month follow-up</td>
<td>Epiretinal membrane</td>
<td>Surgery for retinal detachment – retina reattached after silicone removal</td>
<td>Hand motions at 18-month follow-up</td>
<td>20/20 at 18-month follow-up</td>
</tr>
</tbody>
</table>

**AH**: aqueous humor  
**IOL**: intraocular lens  
**IOP**: intraocular pressure  
**PPV**: pars plana vitrectomy  
**VA**: visual acuity

Aqueous humor and vitreous samples from tap were always performed at admission (Day 1), before the first intravitreal injection of antibiotics. The time period of sampling during PPV is noted, using Day 1 as admission.
THE FRIENDS GROUP

FRench Institutional ENDophthalmitis Study group

Participants:

Study coordinator: Christophe Chiquet

Statistics, methodology:
François Vandenesch, Gilles Thuret

Database management:
Pierre-Loïc Cornut

Ophthalmology:
- University Hospital of Dijon: Pierre-Olivier Lafontaine, Marie Passemard, Catherine Creuzot-Garcher, Alain Bron
- University Hospital of Grenoble: Viviane Moreau-Gaudry, Christophe Chiquet, Karine Palombi, Jean-Paul Romanet
- University Hospital of Lyon (E. Herriot Hospital): Pierre-Loïc Cornut, Frédéric Rouberol, Philippe Denis
- University Hospital of Saint-Etienne: Gilles Thuret, Philippe Gain

Microbiology:
- University Hospital of Dijon: André Péchinot, Catherine Neuwirth
- University Hospital of Grenoble: Jacques Croizé, Max Maurin
- University Hospital of Lyon (E. Herriot Hospital): Gérard Lina, Jérôme Etienne, (Neurocardiologique Hospital): Yvonne Benito, Sandrine Boisset, Anne Tristan, François Vandenesch
- University Hospital of Saint-Etienne: Anne Carricajo, Gérard Aubert

Mycology:
- University Hospital of Dijon: Frédéric Dalle, Alain Bonin
- University Hospital of Grenoble: Bernadette Lebeau, Hervé Pelloux
- University Hospital of Lyon: Frédérique de Montbrison, Stéphane Picot
- University Hospital of Saint-Etienne: Hélène Raberin, Roger Tran Manh Sung

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