

## *Stenotrophomonas Maltophilia* Endophthalmitis Caused by Surgical Equipment Contamination: an Emerging Nosocomial Infection

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### Abstract

**Purpose:** We report three cases of *Stenotrophomonas maltophilia* endophthalmitis after uneventful extracapsular cataract extraction with intraocular lens implantation-related to surgical equipment contamination.

**Case report:** All patients developed acute, culture-positive endophthalmitis in a period ranging from 2 to 13 days. Cultures from vitreous tap, as well as those obtained from the hand-piece of the irrigation-aspiration system, revealed *S. maltophilia* as the causing infectious agent. All patients received intravitreal antibiotic treatment as initial therapy, nevertheless, visual disturbance continued to be present, hence pars plana vitrectomy was required.

**Conclusion:** Contamination of surgical-reusable equipment should be considered in addition to the well-known risk factors associated with development of endophthalmitis by *S. maltophilia*.

**Keywords:** Exogenous Endophthalmitis; *Stenotrophomonas Maltophilia*; Surgical Equipment Contamination

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### INTRODUCTION

Infectious endophthalmitis is a condition in which the internal structures of the eye are invaded with replicating micro-organisms, resulting in an inflammatory response that may involve all tissues of the eye.<sup>[1]</sup>

Exogenous endophthalmitis may occur after any situation through which a communication between the interior of the eye and the external environment has been created.<sup>[2]</sup> Contamination after an ophthalmological surgical procedure may be divided in two categories: (1) Contamination during the surgical procedure due to inadequate sterilization of any fluid, instrument or prosthetic device used in surgery and (2) during the postoperative period, probably due to wound leaks, premature suture removal or vitreous wicks.<sup>[3]</sup>

Since cataract extraction is by far the most frequent ophthalmic surgical procedure, most cases of postoperative endophthalmitis follow cataract surgery.<sup>[1,4]</sup>

Bacteria are the most common group of organisms causing endophthalmitis. Although gram-positive organisms are responsible for 60-80% of acute infections (e.g. *Staphylococcus* sp.), gram-negative organisms still play an important role accounting for approximately 20% of all cases (e.g. *Neisseria*, *Haemophilus*, *Pseudomonas*, *Klebsiella*).<sup>[1,4,5]</sup>

*Stenotrophomonas maltophilia* is an opportunistic, gram-negative bacillus, related to *Pseudomonas* sp., which can be isolated from water, soil, and some human, animal or vegetable sources. In human beings, it is a potentially pathogenic organism with a broad clinical

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spectrum. Systemic pathogenicity of *S. maltophilia* has been demonstrated in cases of septicemia, endocarditis, pneumonia, urinary tract infections and postoperative wound infections.<sup>[6]</sup> The incidence of isolation of *S. maltophilia* from clinical infection is increasing, in part probably due to inappropriate use of broad-spectrum antimicrobial agents.<sup>[7]</sup> Of late, nosocomial colonization and infection are the most common source of acquiring this gram-negative bacillus.<sup>[6]</sup>

Previous reports of ophthalmic infections with *S. maltophilia* included conjunctivitis, keratitis, preseptal cellulitis, dacryocystitis and endophthalmitis.<sup>[6,8]</sup> However, *S. maltophilia* was the most common micro-organisms found in cultures of aspiration fluids from phacoemulsification and vitrectomy instruments.<sup>[8]</sup>

We report three cases of *S. maltophilia* endophthalmitis after uneventful extracapsular cataract extraction (ECCE) with intraocular lens implantation and its possible relationship with the recovery of this micro-organism from a hand-piece irrigation-aspiration system.

## CASE REPORTS

### Case 1

An 83-year-old woman underwent uncomplicated ECCE with posterior chamber intraocular lens (PCIOL) implantation in the left eye (OS) in a surgical facility located in a rural village, in December 2010. The past medical history of patient was unremarkable. Previous best corrected visual acuity (BCVA) was 20/60 in the right eye (OD) and 20/100 OS. After surgery, topical dexamethasone-ciprofloxacin drops every 2 hours were prescribed. Two days after surgery, the patient complained of decreased visual acuity (VA) and pain on OS. Her vision at that moment was 20/800. Slit-lamp examination revealed moderate corneal edema with a 2 mm hypopyon. Fundus examination was difficult to perform due to severe vitreous inflammation and corneal edema. A vitreous tap was collected through pars plana, and intravitreal (IV) injections of ceftazidime (2.25 mg), vancomycin hydrochloride (1.0 mg) and dexamethasone sodium (0.4 mg) were given. A combined regimen of topical dexamethasone-ciprofloxacin every hour and atropine sulfate 3 times daily was also initiated.

Three days later, *S. maltophilia* was isolated from culture. Laboratory testing for *in vitro* sensitivity reported that the micro-organism was resistant to ceftazidime but sensitive to amikacin and ciprofloxacin.

At this time, the patient was referred to our practice. Six days after the initial surgery, as her clinical condition did not improve, pars plana vitrectomy (PPV) was performed [Table 1]. After vitrectomy, an IV injection of amikacin (0.4 mg) was administered. Topical combination drops of dexamethasone-ciprofloxacin every 2 hours and atropine sulfate 2 times daily were prescribed.

One week later, the patient was more comfortable, VA was 20/400 and there was no evidence of inflammation in OS.

In January 2011, the patient returned with decreased VA of the previously affected eye. A retinal detachment was diagnosed and a new PPV was performed. In the last visit, VA was 20/80 OS and the retina was successfully attached.

### Case 2

A 77-year-old male was referred to our clinic in December 2010 from the same surgical facility as in the first case. The patient medical history was significant for arterial hypertension. His surgical history included an uncomplicated ECCE with PCIOL implantation in his OS 4 days earlier. After surgery, he received topical dexamethasone-ciprofloxacin drops every 2 hours. The patient was referred that 3 days following cataract surgery, with pain and decreased VA in OS and at that time, he received intravitreal injection of ceftazidime (2.25 mg), vancomycin hydrochloride (1.0 mg) and dexamethasone sodium (0.4 mg) after a vitreous tap was taken. Atropine sulfate drops 3 times a day was added to the treatment after injections.

On examination, BCVA was light perception in OS. Severe corneal edema, hypopyon and severe fibrin reaction on anterior chamber was found. Fundus examination could not be done since a pupillary membrane and corneal edema precluded observation of the vitreous cavity. The culture results from the vitreous tap grew *S. maltophilia* with the same antibiotic sensitivity mentioned in case 1.

Pars plana vitrectomy was performed 24 hours later and amikacin (0.4 mg) was injected into the

**Table 1. Cases evolution following *S. maltophilia* endophthalmitis treatment**

Case report number	Type of surgery	Infection time (days)	Initial treatment	Initial VA <sup>†</sup>	PPV <sup>‡</sup>	Final VA
1	ECCE <sup>††</sup>	2	Intravitreal*+topical**	20/100	Yes	20/80
2	ECCE <sup>††</sup>	3	Intravitreal*+topical**	Light perception	Yes	20/40
3	ECCE <sup>††</sup>	13	Intravitreal*+topical**	Hand motion	No	20/400

<sup>†</sup>VA, visual acuity; <sup>‡</sup>PPV, pars plana vitrectomy; <sup>††</sup>ECCE, extracapsular cataract extraction; \*Initial Intravitreal treatment: Ceftazidime (2.25 mg); vancomycin (1.0 mg) and dexamethasone (0.4 mg); \*\*Initial topical treatment: Dexamethasone-ciprofloxacin and atropine sulfate; *S. maltophilia*, *Stenotrophomonas maltophilia*

vitreous cavity. Topical treatment was continued following surgery. The endophthalmitis resolved and no recurrences were observed to date and BCVA in the affected eye improved to 20/40 [Table 1].

### Case 3

An 82-year-old woman with a history of hypertension and stroke presented to our outpatient clinic complaining of pain and inflammation in OD. The patient underwent a presumed uneventful ECCE with PCIOL implantation on OD in December 2010 in the same clinic where the two former patients underwent eye surgery, but by different ophthalmologists.

After ECCE surgery, topical dexamethasone-ciprofloxacin drops every 2 hours were administered. Thirteen days following surgery, chemosis, lid edema, severe inflammation, a 2 mm mixture of hypopyon and hyphema, cornea edema and a pupillary membrane were found on her OD. On the day of the visit to our clinic, VA was hand motion (HM) and severe vitritis was present at that moment. A vitreous tap was performed, and she was given intravitreal injections of ceftazidime (2.25 mg), vancomycin hydrochloride (1.0 mg) and dexamethasone sodium (0.4 mg). Topical medication was continued every 2 hours adding atropine sulfate.

*Stenotrophomonas maltophilia* was isolated from the culture of vitreous aspirates, with the same spectrum of antibiotic sensitivity as the two previously reported cases. A new intravitreal injection was done, switching from ceftazidime to amikacin (0.4 mg) based on the *in vitro* sensitivity results from our culture.

One week later, inflammation in OD resolved slightly, but due to poor general health of the patient, we decided to continue the treatment with topical antibiotics and observation rather than vitrectomy. After 3 weeks, there was no pain and less inflammation but VA remained in the HM range due to vitreous opacities. Three months later, vitreous haze resolved partially and BCVA improved to 20/400 [Table 1].

Following the third patient's referral, the surgeons from the eye clinic were contacted. Cultures were obtained from all surgical instruments and the operating room. Cultured samples of silicon surgical-reusable tube were positive for *S. maltophilia* demonstrating the source of the intraocular infections in these three patients.

In response to this outbreak, health-care providers and ancillary staff members received extensive education regarding standard precautions including safe reusable device practices.

## DISCUSSION

*Stenotrophomonas maltophilia* is a potential opportunistic intraocular pathogen.<sup>[7-9]</sup> Currently, the incidence of

this multiresistant gram-negative bacillus is increasing since it is naturally resistant to many broad-spectrum antibiotics such as carbapenems and therefore often difficult to eradicate. Risk factors for systemic infection by this organism include recurrent or long-term hospitalizations, immunodeficiency states, exposure to catheters or other invasive devices, previous exposure to broad-spectrum antibiotics and a history of malignant neoplasms.<sup>[6]</sup>

In spite of its ubiquity, ocular infections by *S. maltophilia* are exceptionally uncommon which may be due to its stunted virulence.<sup>[8]</sup> This apparently low pathogenic potential does not restrict the importance of this gram-negative bacillus as an opportunistic ocular pathogen, given its resistance to antimicrobials and difficulty in eradication as previously mentioned.<sup>[8]</sup> Most of the reports, described acquiring infections as part of a polymicrobial infection. The majority of them were from external eye infections such as suppurative keratitis, infected scleral buckles and scleritis.<sup>[9-11]</sup>

The first reported case of *S. maltophilia* endophthalmitis was in a patient with acquired immunodeficiency syndrome (AIDS) following a gancyclovir device implantation.<sup>[12]</sup> Kaiser et al reported a case of endophthalmitis 6 days after cataract extraction in an old immunocompetent woman.<sup>[13]</sup> Most recent reports described a series of immunocompetent patients with *S. maltophilia* endophthalmitis after cataract surgery<sup>[14]</sup> and in some of these reports, the source of infections was identified to be the rinsing solution used during cataract surgery which was contaminated with *S. maltophilia*.<sup>[15-17]</sup> In 2006, Karakurt et al<sup>[18]</sup> reported six cases of endophthalmitis following cataract extraction which four of them lacked significant past medical history and could be considered immunocompetent but two might be immunologically affected; one female patient had a history of rheumatoid arthritis and the last patient suffered from diabetes mellitus.

In our series, the patients were elderly individuals over the age of 77 but the significant issue is that the three of them had no history of immunodeficiency. On the other hand, as the most important epidemiological data, the three cases underwent consecutive surgeries done by two different surgeons, but at the same institution with the same surgical equipment. This situation alerted physicians to culture all the instruments commonly used in these surgeries. This simple procedure found the common source of the three infections to be two reusable silicon tubes at the end of the irrigation-aspiration hand-piece employed in the surgical procedures [Figure 1]. This might be due to the frequent affinity of *S. maltophilia* for water sources and its high capacity for survival on different environmental materials.

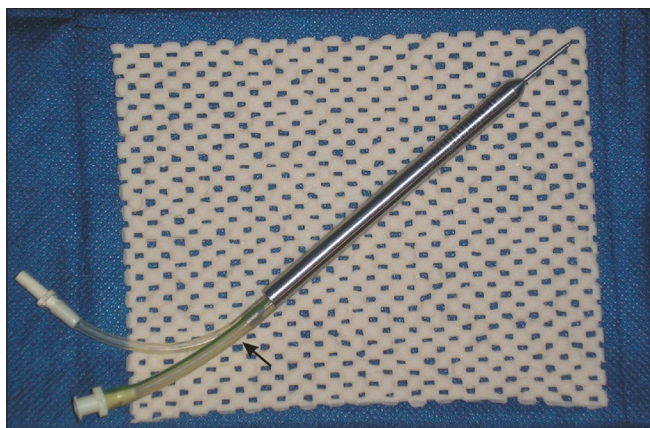
Clinical characteristics in our patients were similar to other reported cases.<sup>[8,18]</sup> The onset of the intraocular



infection was acute and began 1-2 weeks after initial surgery. Inflammation involved vitreous cavity soon after onset in all of the cases. Corneal edema, hypopyon, fibrin reaction with pupillary membrane formation and severe inflammation involving vitreous cavity soon after onset, making the fundus view indistinguishable, were present in all three patients described in our paper.

In our opinion, the sensitivity of the pathogen to the antibiotics is one of the most important factors determining the course of the disease. Several reports<sup>[1,5,7,19]</sup> have described multiresistant strains of *S. maltophilia*, as well as acquired resistance to fluoroquinolones such as ciprofloxacin.<sup>[20,21]</sup> In our series, two of the three cases of *S. maltophilia* endophthalmitis isolated from culture, were resistant to ceftazidime but sensitive to amikacin and ciprofloxacin. All patients were treated initially with IV ceftazidime, however, due to poor response to this therapy, two of them underwent vitrectomy to improve their clinical outcome. The third patient was not healthy enough to tolerate a surgical procedure, so an intravitreal injection of amikacin done with good clinical evolution, but her vision partially recovered since vitreous haze resolved incompletely. This experience let us to speculate that vitrectomy is necessary to restore better VA.

Recognized risk factors associated with the development of ocular infections by *S. maltophilia* include a history of previous intraocular and extraocular procedures.<sup>[8,10,18]</sup> On the other hand, this organism is becoming increasingly responsible for both opportunistic and systemic nosocomial infections.<sup>[7]</sup> Contamination in suction tubes were found by Yorioka et al after three different disinfection methods and the contaminants detected in the tubes were gram-negative rods such as *Pseudomonas aeruginosa*, *Acinetobacter baumannii* and *S. maltophilia*.<sup>[22]</sup> The opportunistic nature of *S. maltophilia* can be shown by microbiologic evidence that this organism can be isolated from contact lens cases and cleaning solutions without associated corneal



**Figure 1.** Positive sample for *Stenotrophomonas maltophilia* in the silicone tube of the hand-piece.

infection.<sup>[8,9]</sup> However, this micro-organism has also been isolated from aspiration systems of phacoemulsification and vitrectomy.<sup>[8]</sup>

In conclusion, the three cases reported herein originally underwent operation in a surgical facility located in a rural village, where disposable elements are not easily provided and probably the re-sterilization systems are not suitable enough, with most likely poorly trained personnel and allied medical staff. The irrigation's hand-piece utilized for these surgeries was studied and cultivated. The examination yielded *S. maltophilia* but how the irrigation-aspiration equipment was contaminated remained elusive.

Risk factors associated with development of endophthalmitis by *S. maltophilia* include a history of previous intraocular or extraocular procedures in an immunocompromise patient, as well as a potential contamination of surgical-reusable equipment. Submission of adequate specimens for microbiologic analysis and appropriate antibiotic therapy plus an urgent vitrectomy may improve visual outcome in these patients.

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