Case Report

Correspondence

Kuan-Jen Chen

cgr999chiayi@yahoo.com.tw

Received 3 December 2008

Accepted 6 January 2009

Traumatic endophthalmitis caused by *Enterococcus raffinosus* and *Enterobacter gergoviae*

Kuan-Jen Chen,¹ Ko-Jen Yang,² Chi-Chin Sun^{1,2} and Ling Yeung²

¹Department of Ophthalmology, Linkou Chang Gung Memorial Hospital, Chang Gung University College of Medicine, Kweishan, Taoyuan, Taiwan, ROC

²Department of Ophthalmology, Keelung Chang Gung Memorial Hospital, Keelung, Taiwan, ROC

We report a rare case of polymicrobial traumatic endophthalmitis caused by *Enterococcus raffinosus* and *Enterobacter gergoviae* with successful interventions of complete pars plana vitrectomy with intravitreal injections of vancomycin and amikacin. In addition, the patient achieved a favourable visual acuity of 20/200.

Case report

A 43-year-old male suffered from a corneolimbal laceration with an iron nail in the right eye while hammering on metal. The patient complained of eye pain and immediate visual loss after ocular injury. His visual acuity at presentation was hand motion in the right eye and 20/20 in the left. On examination, the anterior segment demonstrated an 8 mm length of full-thickness corneolimbal laceration, fibrin over the anterior chamber, traumatic aniridia and traumatic cataract. No fundal details were visible. Penetrating injury of the eyeball with traumatic endophthalmitis was diagnosed, and an emergent operation was arranged immediately to perform primary suture of the corneolimbal laceration, pars plana lensectomy and vitrectomy. Conditions identified during the surgery were diffuse arterial and venous vasculitis, superotemporal retinal detachment with retinal tears, vitreous haemorrhage and subretinal haemorrhage. At the end of surgery, prophylactic photocoagulation (over retinal breaks and 360° peripheral retina) and silicone oil endotamponade were performed, and the patient was treated with intravitreal vancomycin [$1 \text{ mg } (0.1 \text{ ml})^{-1}$], amikacin [$0.25 \text{ mg } (0.1 \text{ ml})^{-1}$] and dexamethasone [$0.4 \text{ mg } (0.1 \text{ ml})^{-1}$]. Postoperative treatment included oral ciprofloxacin (500 mg, twice per day), and topical vancomycin (25 mg ml^{-1} , hourly), amikacin (25 mg ml^{-1} , hourly) and 1% prednisolone acetate (four times per day).

Gram staining of a vitreous sample demonstrated Gram-positive cocci, Gram-negative bacilli and numerous neutrophils. The vitreous fluid sample was cultured in thioglycolate broth, and on chocolate blood agar, eosin methylene blue agar and tryptic soy agar with 5% sheep blood. Bacterial growth detected after 72 h revealed mixed organisms, which were then identified as *Enterobacter gergoviae* and *Enterococcus raffinosus* on day five. The *Enterobacter gergoviae* isolate was strongly urease-positive; however, it was negative for adonitol, inositol and sorbitol

utilization. The isolate was confirmed as *Enterobacter gergoviae* by the API 20E system (bioMérieux). Identification of the enterococcal species may be complicated by misidentification by the API 20 Strep system. Therefore, *Enterococcus raffinosus* was confirmed by conventional tests, including growth on bile aesculin agar and with 6.5% NaCl. The *Enterococcus raffinosus* isolate showed positive pyrrolidonyl arylamidase, mannitol, sorbose, arabinose and raffinose reactions; it was negative for arginine dihydrolase. The standard Kirby–Bauer disc diffusion technique was utilized for antibiotic susceptibility testing of the *Enterobacter gergoviae* and *Enterococcus raffinosus* isolates. The *Enterobacter gergoviae* isolate was sensitive to piperacillin, piperacillin–tazobactam, amikacin, gentamicin, aztreonam, cefuroxime, ceftazidime, ceftriaxone, ciprofloxacin and ertapenem; however, it was resistant to cefazolin and amoxicillin–clavulanic acid. The *Enterococcus raffinosus* isolate was sensitive to penicillin, ampicillin, vancomycin and teicoplanin. On day 10, the inflammation of the anterior and posterior segments decreased significantly; in addition, the visual acuity improved to counting fingers. Six weeks later, retinal detachment with foveal involvement was identified at the temporal retina. Meanwhile, proliferative vitreoretinopathy with three retinal holes was identified. Pars plana vitrectomy with retinectomy, encircling scleral buckle, laser photocoagulation and silicone oil endotamponade were performed. Three months later, visual acuity with aphakic correction was 20/200 without complication in the right eye. Fundus examination showed fine epiretinal membrane over the posterior pole, and revealed resolution of the retinal vasculitis.

Discussion

Infectious endophthalmitis is a potentially devastating complication of penetrating ocular injuries. Polymicrobial traumatic endophthalmitis is not uncommon and usually

causes a poor final visual outcome, especially with virulent organisms such as Gram-negative bacteria, *Streptococcus* species, *Enterococcus* species and *Bacillus cereus* (Lieb *et al.*, 2003). *Enterococcus raffinosus* is a recently described species that is occasionally isolated from human clinical infectious specimens, including blood, urine, abscesses and vertebral osteomyelitis; however, the natural habitat of *Enterococcus raffinosus* is still unknown (Kawalec *et al.*, 2007; Sandoe *et al.*, 2001). *Enterobacter gergoviae* belongs to the family *Enterobacteriaceae*, and is an opportunistic endophyte because it can live in soil and colonize maize roots (An *et al.*, 2007). *Enterobacter gergoviae* has been isolated from cosmetics and water; it has also been recovered from the urinary tract, respiratory tract, abdominal abscess and blood (Cheng & Chen, 1994; Stock & Wiedemann, 2002). These two virulent organisms have rarely been identified in infectious endophthalmitis in the literature. Herein, we describe a patient with polymicrobial traumatic endophthalmitis caused by *Enterococcus raffinosus* and *Enterobacter gergoviae*.

As with postoperative endophthalmitis, most of the cases of post-traumatic endophthalmitis are due to Gram-positive organisms, with about 10–15% being caused by Gram-negative organisms. The majority of the Gram-positive organisms are *Staphylococcus*, *Streptococcus*, *Enterococcus* and *Bacillus* species. Meanwhile, the Gram-negative organisms are mainly *Pseudomonas aeruginosa* and some species of the family *Enterobacteriaceae*. In the genus *Enterobacter*, *Enterobacter aerogenes* and *Enterobacter cloacae* are the species most commonly encountered in clinical specimens. They are widely distributed in water, in sewage, in soil and on vegetables. They have been identified in some cases of traumatic endophthalmitis; however, *Enterobacter gergoviae* has rarely been identified in ocular trauma. About 10–30% of cases of post-traumatic endophthalmitis are due to polymicrobial traumatic endophthalmitis, and this incidence is much higher than after cataract surgery (Nobe *et al.*, 1987). Polymicrobial traumatic endophthalmitis may be caused by Gram-positive bacteria, Gram-negative bacteria or mixed organisms such as in our case.

Vancomycin-resistant *Enterococcus raffinosus* isolates were reported in a hospital outbreak of vancomycin-resistant enterococci; they demonstrated resistance to penicillin, ampicillin, vancomycin and teicoplanin (Kawalec *et al.*, 2007). In our case, the current environmental *Enterococcus raffinosus* isolate was susceptible to penicillin, ampicillin, vancomycin and teicoplanin, and it showed a similar antibiotic susceptibility pattern to that of an *Enterococcus raffinosus* isolate from a patient with vertebral osteomyelitis (Sandoe *et al.*, 2001). *Enterobacter gergoviae* is naturally sensitive or intermediately sensitive to tetracyclines, aminoglycosides, numerous β -lactams (piperacillin, amoxicillin-clavulanic acid, several cephalosporins, carbapenems, aztreonam) and quinolones (Stock & Wiedemann, 2002). *Enterobacter gergoviae* isolates producing extended-spectrum β -lactamases have been reported. They were highly resistant to ampicillin, piperacillin, cefazolin and

cefuroxime, and moderately susceptible to ceftazidime and ceftriaxone (Cheng & Chen, 1994). In the current case, the environmental *Enterobacter gergoviae* isolate did not produce an extended-spectrum β -lactamase. It was susceptible to piperacillin, aminoglycosides, aztreonam, cefuroxime, ceftazidime, ceftriaxone, ciprofloxacin and ertapenem; however, it was resistant to cefazolin and amoxicillin-clavulanic acid. Unlike nosocomial strains, both naturally environmental strains did not show multiple antibiotic resistance.

Standard treatment regimens for *Enterococcus raffinosus* and *Enterobacter gergoviae* infections have not yet been established. Nevertheless, intravitreal injections of antibiotics have become a commonly utilized standard treatment for infectious endophthalmitis. The intraocular concentration of antibiotics after intravitreal injection is far greater than that achieved by any other method of antibiotic administration. In the Endophthalmitis Vitrectomy Study (Han *et al.*, 1996), all patients received intravitreal amikacin [$0.4 \text{ mg (0.1 ml)}^{-1}$] and vancomycin [$1 \text{ mg (0.1 ml)}^{-1}$], but the current antibiotic treatment for endophthalmitis includes vancomycin for Gram-positive coverage and either ceftazidime or an aminoglycoside for Gram-negative coverage. Most of the ocular infectious organisms are susceptible to vancomycin or either ceftazidime or an aminoglycoside. In our case, although *Enterococcus raffinosus* and *Enterobacter gergoviae* rarely occur in infectious endophthalmitis, the above treatment still applied. Therefore, intravitreal antibiotics are the most important component of therapy in eradicating infection in acute-onset bacterial endophthalmitis. In addition, pars plana vitrectomy allows treatment of the residual intraocular effects of the trauma, such as retained lens cortex, vitreous haemorrhage and retinal breaks, as well as allowing removal of infected vitreous, bacteria and toxins.

In summary, *Enterococcus raffinosus* and *Enterobacter gergoviae* are rarely identified in infectious ocular disease. We report a case of polymicrobial traumatic endophthalmitis caused by *Enterococcus raffinosus* and *Enterobacter gergoviae*. Successful interventions of complete pars plana vitrectomy with intravitreal injections of vancomycin and amikacin achieved a favourable visual outcome.

References

- An, Q., Dong, Y., Wang, W., Li, Y. & Li, J. (2007). Constitutive expression of the *nifA* gene activates associative nitrogen fixation of *Enterobacter gergoviae* 57-7, an opportunistic endophytic diazotroph. *J Appl Microbiol* **103**, 613–620.
- Cheng, Y. & Chen, M. (1994). Extended-spectrum beta-lactamases in clinical isolates of *Enterobacter gergoviae* and *Escherichia coli* in China. *Antimicrob Agents Chemother* **38**, 2838–2842.
- Han, D. P., Wisniewski, S. R., Wilson, L. A., Barza, M., Vine, A. K., Doft, B. H. & Kelsey, S. F. (1996). Spectrum and susceptibilities of microbiologic isolates in the Endophthalmitis Vitrectomy Study. *Am J Ophthalmol* **122**, 1–17.

Kawalec, M., Kedzierska, J., Gajda, A., Sadowy, E., Wegrzyn, J., Naser, S., Skotnicki, A. B., Gniadkowski, M. & Hryniewicz, W. (2007). Hospital outbreak of vancomycin-resistant enterococci caused by a single clone of *Enterococcus raffinosus* and several clones of *Enterococcus faecium*. *Clin Microbiol Infect* **13**, 893–901.

Lieb, D. F., Scott, I. U., Flynn, H. W., Jr, Miller, D. & Feuer, W. J. (2003). Open globe injuries with positive intraocular cultures: factors influencing final visual acuity outcomes. *Ophthalmology* **110**, 1560–1566.

Nobe, J. R., Gomez, D. S., Liggett, P., Smith, R. E. & Robin, J. B. (1987). Post-traumatic and postoperative endophthalmitis: a comparison of visual outcomes. *Br J Ophthalmol* **71**, 614–617.

Sandoe, J. A., Witherden, I. R. & Settle, C. (2001). Vertebral osteomyelitis caused by *Enterococcus raffinosus*. *J Clin Microbiol* **39**, 1678–1679.

Stock, I. & Wiedemann, B. (2002). Natural antibiotic susceptibility of *Enterobacter amnigenus*, *Enterobacter cancerogenus*, *Enterobacter gergoviae* and *Enterobacter sakazakii* strains. *Clin Microbiol Infect* **8**, 564–578.