Endophthalmitis, a rare metastatic bacterial complication of haemodialysis catheter-related sepsis

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Introduction

It is well-recognized that the arterio-venous (A/V) fistula is the best form of access to the circulation for maintenance haemodialysis [1]. The A/V fistula is less likely to fail than other methods of access, such as the Polytetrafluoroethylene graft, the tunnelled dialysis catheter and the emergency temporary dialysis catheter. Furthermore, a good A/V fistula reduces the risk of bacteraemia and the morbidity, mortality and hospitalization associated with that complication. Even when an A/V fistula has been in long-term use, it is possible for the access to be lost suddenly through thrombosis or localized infection. Under these circumstances, emergency temporary vascular access is required, using percutaneous polyurethane catheters inserted directly into the jugular or femoral veins. The risk of bacterial infection with these lines is high, ranging from localized infection at the exit site to bacteraemic illness with systemic symptoms and on to life-threatening conditions such as endocarditis, metastatic pyaemia and paravertebral abscess. We report an unusual case of metastatic infection in the form of acute endophthalmitis, and make some observations on clinical management of this rare condition.

The case

A 75-year-old male, established on haemodialysis in 2002 using a left braciocephalic A/V fistula, presented in January 2006 with thrombosis of the fistula. A temporary right internal jugular line was inserted for emergency dialysis, pending surgery to the thrombosed fistula. One week later, the patient presented with general malaise and pain at the dialysis catheter exit site, associated with fever with rigors. On examination, there was evidence of an exit site infection, and it was assumed that he had a catheter-related bacteraemia. He was admitted to hospital, blood cultures were taken, intravenous vancomycin was given, and the temporary dialysis catheter was removed. Staphylococcus aureus was grown in all, the six out of six blood culture bottles, and from the dialysis catheter tip, within 12 h of presentation. The organism subsequently proved to be fully sensitive to fluoxacin, which was started in a dose of 1 g, intravenously, four times a day.

On the day after admission, the patient complained of sudden onset of pain and decreased vision in the left eye. On examination, the left eye was erythematous and the pupil size was small with sluggish light reflex. His vision was reduced to hand movements only. Slit lamp examination showed grade III anterior chamber cells and an iris flare in the left eye. It also revealed a hypopyon with horizontal level and diminished red reflex (Figure 1). On posterior segment examination, the vitreous media was opaque, implying the presence of inflammatory cells in the vitreous cavity. Examination of the right eye was unremarkable.

A diagnosis of metastatic bacterial endophthalmitis was made on the basis of the clinical findings in the anterior segment, the reduced vision and positive blood cultures. A vitreous sample was also taken for microbiological analysis.

He was treated initially with intravitreal vancomycin (1 mg/0.1 ml) and amikacin (400 μg/0.1 ml). He was also started on ofloxacin 0.3% eye drops every 2 h, gentamicin 0.3% eye drops every 2 h, prednisolone 0.1% eye drops every 2 h and atropine 1% eye drops three times a day. He was reviewed daily by an ophthalmologist.

Three days following intra-vitreal antibiotics, his vision improved slightly to finger counting and the hypopyon had organized into a triangular formation.
Systemic and local antibiotics were continued. Vitreous cultures did not grow any organisms, but it was assumed that the infecting organism was the *S. aureus* isolated in the blood cultures, and that failure to grow from the vitreous culture was because of the administration of antibiotics at the time of admission.

By day 14, post intravitreal antibiotics, the vision in his left eye had improved to 2/60 and to 3/60 with spectacles. The hypopyon was resorbing and appeared much smaller than before (Figure 2). The posterior segment could be visualized, showing a healthy optic disc and macula with exudative material inferiorly in the vitreous cavity. Systemic and local antibiotics were continued for 4 weeks.

By day 30, his vision had improved to 4/60 with spectacles and the hypopyon had totally disappeared, however the vitreous exudates were still present inferiorly (Figure 3).

His vision has improved further in his left eye over a period of time and by day 45 he had visual acuities of 6/18 with spectacles improving to 6/12 with pinhole.

His C-reactive protein (CRP) gradually improved and was <5 mg/l, white cell count $6.4 \times 10^9$/l and neutrophils $4.4 \times 10^9$/l at the time of discharge, 3 weeks after admission. The original A/V fistula could not be salvaged and he was referred for further A/V fistula surgery. A tunneled haemodialysis catheter was inserted 2 weeks after his admission.

**Discussion**

Bacterial endophthalmitis can be classified as exogenous or endogenous, and is an ophthalmic emergency. Exogenous endophthalmitis follows either penetrating injury to the globe or intraocular surgery. It is most frequently caused by *Staphylococcus* or *Pseudomonas*, and its clinical course is catastrophic [2]. Endogenous or metastatic endophthalmitis is defined as an ocular infection in which the initial focus of infection is a site distal to the eye. Haematogenous spread is the predominant pathway by which the microbe reaches the eye [3]. Rarely, there may be a spread through the sclera from adjacent infected tissues. Most cases of endogenous endophthalmitis are unilateral with the right eye affected more frequently, probably due to a more direct arterial flow via the right carotid artery [4].

Endogenous or metastatic bacterial endophthalmitis is a rare but devastating complication of sepsicaemia, with a prevalence of 2–8% of all cases of endophthalmitis [5]. Endogenous bacterial endophthalmitis is associated with chronic diseases such as diabetes mellitus, chronic renal failure, invasive medical procedures, non-ocular surgery, injected drug abuse, or prolonged placements of central venous lines [5]. Gram-positive bacteria are the most common pathogens [5]. It occurs as a complication of acute, systemic bacterial infection, and was not uncommon prior to the antibiotic era [6]. The introduction of antibiotics had a profound influence in decreasing the incidence and severity of acute bacterial diseases and their ocular complications. Metastatic bacterial endophthalmitis has virtually disappeared [7], but when it does occur, antibiotic treatment only
somewhat improves the otherwise poor prognosis for ocular acuity [3]. The diagnosis of metastatic staphylococcal endophthalmitis, in our case, is based on the observations that the endophthalmitis occurred following a well-documented episode of staphylococcal sepsis, the absence of clinical or laboratory evidence for any other infecting organism, and the excellent response to systemic and local antibacterial therapy. When endogenous endophthalmitis is suspected, cultures of blood, urine, aqueous and vitreous humor and any other clinically relevant fluid should be obtained [8]. Blood cultures may be positive in up to 71% of patients with endogenous endophthalmitis, while positive vitreous and aqueous cultures range from 61% to 70% [9].

Treatment of metastatic bacterial endophthalmitis is difficult, due to poor systemic antimicrobial penetration into the vitreous humor by the blood-retinal barrier, as retinal vessels lack fenestration and inflammation has little effect on the integrity of this barrier [10]. Prompt administration of intra-vitreal antibiotic therapy is the key in the acute management of endogenous endophthalmitis. Systemic antibiotics also treat distant foci of infection and prevent continued bacteraemia, thereby reducing chances of invasion of the unaffected eye. Empirical broad-spectrum antibiotic therapy with vancomycin and an aminoglycoside or a third-generation cephalosporin is recommended [11].

Metastatic bacterial endophthalmitis is a rare complication of dialysis catheter-related sepsicaemia. To the best of our knowledge, there have been only two such reports, representing five cases [12,13]. When suspected, urgent ophthalmological evaluation and treatment is needed to reduce the risk of loss of vision in the affected eye. Catheter-related sepsis can be reduced by using tunnelled, rather than non-tunnelled lines and by application of an anti-microbial ointment (mupirocin or polysporin) to the catheter exit site, or instillation of an anti-microbial solution (gentamicin or taurolidine) into the catheter lumen [14].

Conflict of interest statement. None declared.