PostScript

LETTERS

Pulsed field gel electrophoresis of chromosomal bacterial DNA in the investigation of infectious endophthalmitis

Endogenous endophthalmitis is a rare ocular condition that accounts for only 2-6% of all cases of endophthalmitis.¹ It is characterised by haematogenous spread of organisms from a remote infectious site to the eye.

Pulsed field gel electrophoresis (PFGE) might be used to determine whether the micro-organisms from the blood and the eye are the same. This technique has been used in ophthalmology in specific situations, such as severe and complex cases or unusual infectious complications (for example, endogenous endophthalmitis caused by otitis media),² or in the confirmation of the aetiology of conjunctivitis outbreaks.³ Here we report a case of endogenous endophthalmitis caused by mitral valve infection and confirmed by PFGE.

Case report

A 51 year old man presented with pain in the left eye, fever, and a pulsatile frontal headache for 3 days. He was taking medical treatment for diabetes mellitus, systemic arterial hypertension, and renal failure, and had been on haemodialysis through a catheter for 4 months. He had no history of artificial heart valve implantation or previous ocular trauma/surgery.

Ocular examination revealed a visual acuity of no light perception in the left eye. Ocular motility was absent in this eye. Intraocular pressure was elevated. External examination showed lid hyperaemia, proptosis, chemosis, mild corneal oedema, hypopyon, hyphaema, fibrin in the anterior chamber, ectropion uveae, rubeosis iridis, paralytic mydriasis, and cataract. Fundus examination was not possible. Examination of the right eye was unremarkable.

Treatment with intravenous vancomycin and ceftriaxone, and topical dexamethasone and atropine was instituted. Blood cultures were obtained. Computed tomography disclosed proptosis of the left eye and extension of the inflammatory process to the orbit. Ultrasound showed diffuse inflammatory membranes in the vitreous, and an echocardiogram showed a 6 mm area of vegetation at the mitral valve.

Enucleation was indicated for the left eye and a vitreous specimen was collected before this procedure was begun. Five blood cultures and the vitreous culture all disclosed methicillin susceptible *Staphylococcus aureus*. Three culture positive blood samples and the vitreous specimen were submitted for PFGE. All strains showed identical patterns of banding (fig 1). Intravenous treatment was changed to oxacillin (6 weeks) and amikacin (for 7 days), which led to a clinical cure of the endocarditis.

Comment

Endogenous endophthalmitis is a rare condition that is frequently misdiagnosed. It may

be associated with up to 15% of cases of endocarditis.⁴ It occurs mainly in patients with underlying, debilitating systemic diseases. In the case presented here, the patient had diabetes mellitus, renal failure, and a recent history of catheter use for haemodialysis. It is possible that the latter was the

original focus of the infection. Afterwards, endocarditis developed and led to endophthalmitis.

In this case, PFGE proved that the same micro-organisms were responsible for the endocarditis and endophthalmitis. PFGE is one of the most reliable techniques for this task.⁵⁻⁷ It has many applications that include karyotyping, strain identification of similar species, characterisation of transformed strains, building of linkage maps, and preparation of DNA for genomic analysis.⁷ This method is based on the digestion of bacterial DNA with restriction endonucleases that recognise few sites along the chromosome, thereby generating large fragments of DNA that cannot be separated effectively by conventional electrophoresis.⁵ In PFGE, the orientation of the electric field across the gel is periodically changed (pulsed), allowing DNA fragments to be separated according to size.⁵ Consequently, PFGE allows the comparison of chromosomal DNA with much simpler profiles than those generated by high frequency restriction endonucleases. All bacteria and fungi can, at least theoretically, be typed by PFGE, and the results are highly reproducible.⁵⁻⁷

This technique has been used in ophthalmology in order to prove that otitis media led to endophthalmitis;² demonstrate that an atypical conjunctivitis outbreak was caused by the same strain responsible for other infections in the past;³ show an unusual origin of ocular *Neisseria meningitidis* infection (from the mother's endocervix)⁸; describe a cluster of *Mycobacterium chelonae* keratitis cases involving patients who underwent laser in situ keratomileusis⁹; and a few other situations.

In conclusion, a direct relation between the infectious agent of endocarditis and endophthalmitis in this rare case of endogenous endophthalmitis was properly established by the use of PFGE. This technique is thus extremely useful in clearly identifying the origin of ocular infections.

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Figure 1 PFGE shows identical banding pattern of *Staphylococcus aureus* obtained from three blood cultures (first ones from left to right) and from the vitreous culture (last one on the right).

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Figure 1 A two port pars plana vitrectomy was performed using an anterior chamber maintainer with limbal infusion to free the intraocular lenses from surrounding vitreous so they could gently float to the posterior pole.

The second lens was then removed in the same fashion and a new IOL was placed by transscleral fixation.³

All three patients had pseudoexfoliation syndrome but no complications were noted during the initial cataract surgeries. The initial dislocation in all cases followed minimal blunt ocular trauma. The second dislocation occurred spontaneously 7–15 days following placement of the secondary sulcus lens. All procedures were performed as described above within 2 days of presentation. Follow up ranged from 6 months to 3 years; postoperative visual acuities ranged from 20/30 to 20/50. No complications developed in the postoperative period.

Comment

Postoperative complications of dislocated IOLs include retinal detachment, cystoid macular oedema, and vitreous haemorrhage.⁴ The behaviour and risk of having multiple dislocated IOLs within the vitreous cavity is not well known and, to our knowledge, there has been only one case report of multiple dislocated IOLs.⁵

Treatment options include observation, medical therapy (pharmacological miosis), repositioning, removal, IOL exchange, or placement of a second IOL into the eye.^{6–8} If dislocation is noted to occur intraoperatively, attempts to retrieve the PCIOI without the use of posterior vitrectomy techniques may be associated with severe posterior segment complications and should be avoided. The temptation to place an anterior chamber IOL (ACIOI) at this time also should be resisted since the potential for complications is difficult to predict, and the presence of an ACIOI may render subsequent management more complex.⁹

Although the initial dislocation in all cases followed minimal blunt ocular trauma, the presence of two dislocated PCIOIs within the vitreous cavity, and the fact that dislocations occurred within 10–20 days, both for the first and second PCIOI likely indicate that residual capsule support was inadequate to place a sulcus lens. Vitrectomy and repositioning with scleral fixation or intraocular lens exchange should be considered first at the time of primary PCIOI dislocation, rather than secondary sulcus fixation of a second PCIOI in pseudoexfoliation syndrome.

In conclusion, pseudoexfoliation syndrome seems to be a risk factor for dislocated foldable IOLs in the vitreous cavity after cataract surgery.¹⁰ Eyes with two foldable IOLs in the vitreous cavity after cataract surgery are at risk of developing posterior segment complications such as retinal detachment, vitreous haemorrhage, and macular oedema. However, performing two port pars plana vitrectomy, with limbal extraction and transscleral fixation of a new IOL results in improved visual acuity and rapid rehabilitation without further complications.

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Table Clinical findings in patients with multiple dislocated intraocular lenses

Patient (eye)	Age (years)	Sex	Pre-phaco VA	Post-phaco VA	Time of first dislocation	Cause of dislocation	Time of placement of second lens	Time of second dislocation	Pre-vitrectomy VA	Post-vitrectomy VA
1	75	F	20/300	20/40	POD #17	Zonular laxity and poor capsular support	Sulcus IOL at POD # 28	POD2 #15	20/400	20/30
2	80	F	20/400	20/40	POD #15	Zonular laxity and poor capsular support	Sulcus IOL at POD # 22	POD2 #20	20/300	20/50
3	60	M	20/200	20/20	POD #10	Zonular laxity and poor capsular support	Sulcus IOL at POD # 25	POD2 #14	20/300	20/50

Phaco, phacoemulsification and intraocular lens (IOL) implantation; VA, Snellen visual acuity; POD, postoperative day; POD2, postoperative day after sulcus IOL.