anterior capsulorhexis contemplating ciliary sulcus fixation of IOL (Figure 2b) and abandoning hydroprocedures. Use of the principles of close chamber technique[1] prevented vitreous loss and posterior segment complications. We routinely use single piece AcrySof IOL for sulcus fixation. In our experience, symmetry of the placement of this IOL is critical and not the bulk of the haptic. At the root of the iris the bulk and the square edge of the single piece haptic will not produce excessive irritation, as it is not mobile.

In summary, this case emphasizes the importance of 'sinking cortex' sign in predicting PPCD in traumatic white mature cataracts for a suitable surgical strategy to achieve satisfactory technical and visual outcomes.

References

1 Vasavada AR, Praveen MR, Nath V, Dave K. Diagnosis and management of congenital cataract with preexisting posterior capsule defect. *J Cataract Refract Surg* 2004; **30**: 403–408.
2 Angra SK, Vajpayee RB, Titiyal JS, Sharma YR, Sandramouli S, Kishore K *et al*. Types of posterior capsular breaks and their surgical implications. *Ophthalmic Surg* 1991; **22**: 388–391.
3 Rao SK, Parikh S, Padhmanabhan P. Isolated posterior capsule rupture in blunt trauma: pathogenesis and management. *Ophthalmic Surg Lasers* 1998; **29**: 338–342.
4 Saika S, Kin K, Ohmi S, Ohnishi Y. Posterior capsule rupture by blunt ocular trauma. *J Cataract Refract Surg* 1997; **23**: 139–140.
5 Thomas R. Posterior capsule rupture after blunt trauma. *J Cataract Refract Surg* 1998; **24**: 283–284.
6 Yasukawa T, Kita M, Honda Y. Traumatic cataract with a ruptured posterior capsule from a non penetrating ocular trauma. *J Cataract Refract Surg* 1998; **24**: 868–869.
7 Vajpayee RB, Angra SK, Honavar SG, Titiyal JS, Sharma YR, Sakhuja N *et al*. Pre-existing posterior capsule breaks from perforating ocular injuries. *J Cataract Refract Surg* 1994; **20**: 291–294.

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Sir,

Safe and effective visualisation of vitreous in the anterior chamber with intracameral fluorescein to facilitate its complete removal

Prolapsed vitreous into the anterior chamber is a commonly encountered surgical problem, either as a result of trauma or in complicated intraocular surgery, such as posterior capsule (PC) rupture during cataract surgery.[1] Indeed, PC rupture is one of the most common complications in cataract surgery especially in the initial stages of training, frequently resulting in herniation of vitreous into the anterior chamber.[2,3] Even though PC rupture is associated with a significant risk of reduced final visual outcome,[4] it has been shown that with prompt and appropriate management of the complications, good visual outcome is possible.[5] Complete clearance of vitreous from the AC is thus essential to prevent further complications such as persistent wound leak with associated pain secondary to vitreous traction on the wound, vitreoretinal traction leading to cystoid macular oedema, retinal tear or retinal detachment, secondary glaucoma, and in some cases corneal endothelial toxicity.[6–9]

The use of fluorescein as a vitreous staining agent was first proposed in the 1980s (Hanemoto, Ophthalmology Times, April 2004), but did not gain much popularity and has never been formally presented or published. It is therefore little known by the younger generation of ophthalmologists. In this study, we revisited this idea and modified the technique for intracameral use.

Materials and methods

Surgical technique

A measure of 1–2 drops ($\sim 60\,\mu$l) of 1% fluorescein minim (Minims, Chauvin Pharmaceuticals) is added to 2 ml of balanced salt solution (BSS®) to give a concentration of 0.03%. This diluted 0.03% fluorescein solution is then injected into the anterior chamber via paracentesis using a 2 ml luer-lock syringe and a 30 G cannula.

The vitreous present in the anterior chamber (Figure 1a) is immediately stained bright yellow-green by the fluorescein and becomes visible (Figure 1b). A standard vitreous cutter (Millennium™) with a separate anterior chamber irrigation port is then used to remove the fluorescein-stained vitreous from the anterior chamber. Given its low toxicity, this fluorescein staining can be repeated several times until the surgeon is satisfied that all the vitreous has been removed.

Intracameral miochol is a useful adjunct to confirm vitreous removal by demonstrating a round pupil without distortion from the vitreous strands, and it was used in some of the patients in our study.

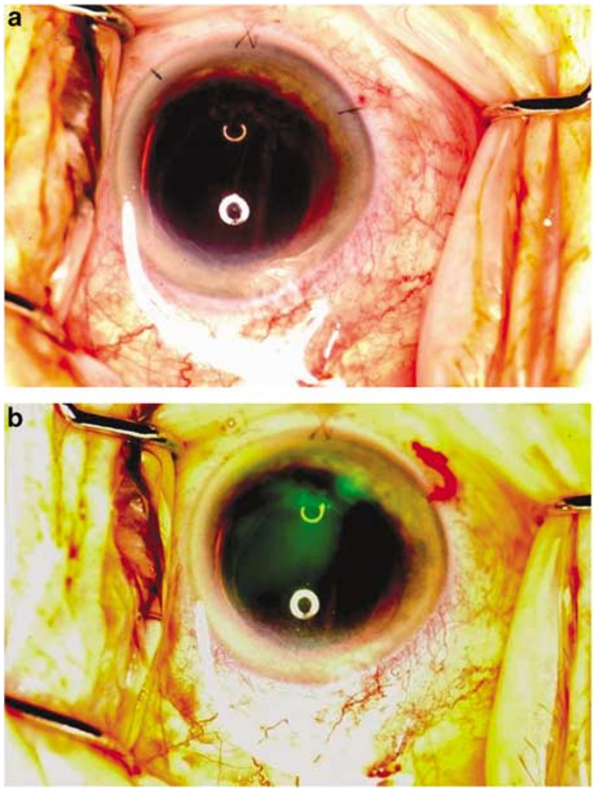

Figure 1 (a) Before intracameral injection of fluorescein, the vitreous in the anterior chamber is barely visible. An IOL implant is *in situ*. (b) After intracameral injection of 0.03% fluorescein, the vitreous in the anterior chamber is instantly stained bright yellow-green.

During anterior vitrectomy, a small port vitrector was used with high cutting rate (480 cuts/min), low aspiration (vacuum of 150 mmHg) and low bottle height (40 cm) to ensure minimal disturbance of the vitreous. A little patience is required to allow the vitreous to come to the port rather than chasing it, thereby stirring the vitreous in the AC, causing vitreous traction.

Patients and methods

We performed this technique on 16 patients from April 1996 to June 2004. All except two patients (Case No. 1 and 5) underwent routine phacoemulsification cataract surgery. Case No. 1 had a dislocated traumatic cataract secondary to shuttlecock injury to the eye, while Case No. 5 had coexisting glaucoma and had a combined phacotrabeculectomy operation. All the patients experienced PC rupture intraoperatively and underwent anterior chamber vitreous clearance and anterior vitrectomy with fluorescein-assisted visualisation of the vitreous. All the patients were under the care of one consultant (MFPG), but surgeons at different grades of training performed the surgery. Patients with other serious ocular comorbidity that precludes a good postoperative visual outcome, such as advanced glaucoma, advanced age-related macular oedema (AMD) and advanced proliferative diabetic retinopathy, were excluded from the study. The best-corrected visual acuity (BCVA) at preoperative assessment and the final BCVA before discharge of these patients were compared. Other factors taken into consideration include preoperative and final intraocular pressure, the follow-up period and whether or not patients developed serious complications such as retinal detachment and postoperative endophthalmitis.

Results

A summary of the results is shown in Table 1.

The majority (13 out of 16 patients, ie 81%) of the patients achieved a final BCVA of 6/9 or better (seven patients had final BCVA of 6/6 and six patients had BCVA of 6/9). Only one patient (Case No. 6) had slightly reduced BCVA postop from 6/12 to 6/24 due to the loss of capsular support, which necessitated the use of anterior chamber intraocular lens (ACIOL) implant.

Another patient (Case No. 7) had transient intraocular pressure (IOP) raised to 70 mmHg on the first day postoperatively, probably due to retained viscoelasticity (Healon®). This resolved quickly on intravenous acetazolamide and topical antiglaucoma treatments. All the patients had IOP within the normal range at the time of discharge.

None of the patients had postoperative retinal detachment or endophthalmitis.

All the patients who underwent routine phacoemulsification cataract surgery and received posterior chamber intraocular lens implant required follow-up period of less than 4 months. Most of them (six out of 11 patients) only required 1-month follow-up. Of the two patients who received anterior chamber intraocular lens implants (Case No. 6 and 9), only one of them (Case No. 9) required prolonged follow-up of 15 months due to the development of ongoing low-grade uveitis, which eventually settled, while the other patient recovered well and was discharged after 3 months. The remaining 14 patients all received posterior chamber silicone intraocular lens implant (SoFlex™, Baush & Lomb) with sulcus fixation.

Discussion

Fluorescein has been in regular use for many years in ophthalmic examinations of both the anterior segment and the posterior segment. It is an essential part of corneal examination whereby staining of the corneal

Table 1 Preoperative and postoperative comparison of patients' visual acuity

Case no.	*Age (year)*	*Sex*	*Preop BCVA*	*Final BCVA*	*Preop IOP*	*Final IOP*	*Follow-up period*	*Comments*
1	59	F	6/18	6/9	20	17	10 months	Shuttlecock injury; traumatic cataract
2	69	F	6/18	6/9	14	14	4 months	
3	93	F	6/18	6/9	20	18	2 months	
4	54	M	6/12	6/6	20	10	1 months	
5	79	M	6/12	6/6	20	13	Long-term	Glaucoma; phacotrab.
6	83	F	6/12	6/24	14	12	3 months	ACIOL secondary to complete capsule loss
7	87	F	6/9	6/9	18	11	1 month	↑ IOP to 70 mmHg postop transiently
8	75	F	6/18	6/6	17	12	2 months	
9	87	F	6/18	6/12	18	16	15 months	ACIOL secondary to zonular dehiscence; prolonged uveitis
10	75	F	6/12	6/6	20	17	2.5 months	
11	54	F	6/12	6/6	16	16	1 month	
12	86	M	6/18	6/9	19	18	3 months	
13	82	F	6/24	6/9	19	17	1 month	
14	63	F	6/60	6/6	18	18	1 month	
15	75	F	6/60	6/12	13	16	2 months	Amblyopic eye
16	86	F	6/9	6/6	12	10	1 month	

BCVA = best-corrected visual acuity.
ACIOL = anterior chamber intraocular lens; IOP = intraocular pressure.
All cases except Case no. 4 and 9 received posterior chamber silicone intraocular lens implant (SoFlex™, Baush & Lomb) with sulcus fixation.

epithelium allows detection of subtle changes and facilitates the assessment of the extent and pattern of epithelial damage.[10] It is also used in applanation tonometry, and more recently, in staining the anterior capsule for capsulorrhexis during cataract surgery[11] and to date, no corneal toxicity of the fluorescein has been reported. Indeed, its inert nature has made it the agent of choice to assess corneal function or corneal damage in investigating the toxicity of other agents on the cornea.[12–14]

Safety of fluorescein in the posterior segment has also been demonstrated in the routine use of fluorescein angiography to visualise retinal vasculature, with no known retinal toxicity. In a recent study by Das *et al*,[15] fluorescein has been used to stain the vitreous during posterior vitrectomy for macular hole surgery, and no complication associated with the dye injection was noted.

In this study, 15 out of the 16 patients showed an improvement in their final postoperative visual acuity compared with preoperative visual acuity, and none of them developed serious complications such as retinal detachment or endophthalmitis. One patient (Case No. 7) had acutely raised IOP to 70 mmHg during the first postoperative day. However, this was quickly controlled by intravenous acetazolamide and topical antiglaucoma treatment, and her IOP returned to below 20 mmHg within 2 days. All patients had normal IOP (ranging from 10 to 18 mmHg) at the time of discharge and none of them required any long-term topical antiglaucoma treatment. It is also interesting to note that the one patient who received phacotrabeculectomy (Case No. 5) due to coexisting glaucoma achieved good IOP control postoperatively as well as good BCVA. One can thus postulate that fluorescein plays very little if any role in the postoperative IOP raise in patient Case No. 7, and the transient IOP raise was due to the presence of retained viscoelasticity (Healon®).

We have not encountered any permanent staining of the silicone SoFlex™ intraocular lens implant (Baush & Lomb) by the use of intracameral fluorescein 0.03%, as encountered with the use of trypan blue on Acqua IOLs by Werner *et al*,[16] and the use of trypan blue and fluorescein 2% on acrylic IOLs by Fritz.[17]

Pandey *et al*[18] have commented on the leakage of fluorescein into the vitreous cavity with its intracameral use, which could not be removed from the vitreous cavity by an irrigation/aspiration system. In our study, fluorescein was seen in the vitreous cavity during surgery. However, the bulk of the dye was removed together with the stained vitreous with a generous anterior vitrectomy. Any residual vitreous staining was dissipated and was not visible by the next day.

Two other vitreous staining agents have recently been described, namely triamcinolone[19,20] and 11-deoxycortisol.[21] However, there are some disadvantages with using triamcinolone as an intracameral staining agent: it is rather expensive, not readily available and is tedious to prepare before use.[22] There is also a significant risk of inducing a rise in IOP.[23,24] 11-Deoxycortisol, on the other hand, is also not

readily available. Being a steroid precursor, it may also potentially precipitate IOP rise, although there is not enough clinical data available to suggest that so far.[21]

In comparison with these two agents, fluorescein has the advantages of being readily available, easy to prepare, with no reported risk of inducing IOP raise or of any ocular toxicity. As shown in this study, fluorescein staining of the vitreous has greatly increased the ease of complete removal of the vitreous from the anterior chamber, which almost certainly contributes to the excellent postoperative visual outcomes in the patients.

In summary, this study shows that appropriate use of intracameral fluorescein provides a safe and effective method of staining the vitreous in the anterior chamber, with no discernable ocular toxicity clinically and excellent long-term visual outcomes. It is thus a safer, more economical and user-friendly alternative to the above-mentioned two agents for intracameral staining of prolapsed vitreous.

References

1 Vajpayee RB, Sharma N, Dada T, Gupta V, Kumar A, Dada VK. Management of posterior capsule tears. *Surv Ophthalmol* 2001; **45**(6): 473–488.
2 Corey RP, Olson RJ. Surgical outcomes of cataract extractions performed by residents using phacoemulsification. *J Cataract Refract Surg* 1998; **24**(1): 66–72.
3 Martin KR, Burton RL. The phacoemulsification learning curve: per-operative complications in the first 3000 cases of an experienced surgeon. *Eye* 2000; **14**(Part 2): 190–195.
4 Ionides A, Minassian D, Tuft S. Visual outcome following posterior capsule rupture during cataract surgery. *Br J Ophthalmol* 2001; **85**: 222–224.
5 Yap EY, Heng WJ. Visual outcome and complications after posterior capsule rupture during phacoemulsification surgery. *Int Ophthalmol* 1999; **23**(1): 57–60.
6 Jaffe NS, Clayman HM, Jaffe MS. Cystoid macular edema after intracapsular and extracapsular cataract extraction with and without an intraocuar lens. *Ophthalmology* 1982; **89**: 25–29.
7 Frost NA, Sparrow JM, Strong NP, Rosenthal AR. Vitreous loss in planned extracapsular cataract extraction does lead to a poorer visual outcome. *Eye* 1995; **9**: 446–451.
8 Cerasoli JR, Kasner D. A follow-up study of vitreous loss during cataract surgery managed by anterior vitrectomy. *Am J Ophthalmol* 1971; **71**: 1040–1043.
9 Johansen J, Theodorsen FP, Corydon L. Visual outcome following complicated extracapsular cataract extraction. *J Cataract Refract Surg* 1992; **18**: 577–581.
10 Feenstra RP, Tseng SC. Comparison of fluorescein and rose bengal staining. *Ophthalmology* 1992; **99**(4): 605–617.
11 Hoffer KJ, McFarland JE. Intracameral subcapsular fluorescein staining for improved visualization during capsulorhexis in mature cataracts. *J Cataract Refract Surg* 1993; **19**(4): 566.
12 Madden PW. The assessment of endothelial integrity by scanning electron microscopy and fluorescein diacetate staining following treatment with cryoprotective additives. *Curr Eye Res* 1989; **8**(1): 17–36.
13 Furrer P, Mayer JM, Plazonnet B, Gurny R. Ocular tolerance of preservatives on the murine cornea. *Eur J Pharm Biopharm* 1999; **47**(2): 105–112.
14 Thiel MA, Morlet N, Schulz D, Edelhauser HF, Dart JK, Coster DJ *et al*. A simple corneal perfusion chamber for drug penetration and toxicity studies. *Br J Ophthalmol* 2001; **85**: 450–453.
15 Das T, Vedantham V. Intravitreal sodium fluorescein enhances visualization of clear vitreous during vitreous surgery for macular hole: a safety and efficacy study. *Clin Experiment Ophthalmol* 2004; **32**(1): 55–57.
16 Werner L, Apple DJ, Crema AS, Izak AM, Pandey SK, Trivedi RH *et al*. Permanent blue discoloration of a hydrogel intraocular lens by intraoperative trypan blue. *J Cataract Refract Surg* 2002; **28**(7): 1279–1286.
17 Fritz WL. Digital image analysis of trypan blue and fluorescein staining of anterior lens capsules and intraocular lenses. *J Cataract Refract Surg* 2002; **28**(6): 1034–1038.
18 Pandey SK, Werner L, Escobar-Gomez M, Roig-Melo EA, Apple DJ. Dye-enhanced cataract surgery. *J Cataract Refract Surg* 2000; **26**(7): 1052–1059.
19 Hanemoto T, Okuyama M, Kawasaki Y, Kawasaki T, Ideata H. Triamcinolone-assisted anterior vitrectomy for suturing intraocular lens in cataract surgery. Presented at the Annual Meeting of the American Academy of Ophthalmology, November 2003, Anaheim, CA.
20 Yamakiri K, Uchino E, Kimura K, Sakamoto T. Intracameral triamcinolone helps to visualize and remove the vitreous body in anterior chamber in cataract surgery. *Am J Ophthalmol* 2004; **138**: 650–652.
21 Kaji Y, Hiraoka T, Okamoto F, Sato M, Hu B, Yamane N *et al*. Visualizing the vitreous body in the anterior chamber Using 11-deoxycortisol after posterior capsule rupture in an animal model. *Ophthalmology* 2004; **111**: 1334–1339.
22 Burk SE, Da Mata AP, Snyder ME, Schneider S, Osher RH, Cionni RJ. Visualizing vitreous using Kenalog suspension. *J Cataract Refract Surg* 2003; **29**(4): 645–651.
23 Jonas JB, Kreissig I, Degenring R. Intraocular pressure after intravitreal injection of triamcinolone acetonide. *Br J Ophthalmol* 2003; **87**: 24–27.
24 Bakri SJ, Beer PM. The effect of intravitreal triamcinolone acetonide on intraocular pressure. *Ophthalmic Surg Lasers Imaging* 2003; **34**(5): 386–389.

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Sir,

Pre-eclampsia resulting in central retinal vein occlusion

Visual obscurations are common during pregnancy.[1] Photopsias, serous retinal detachments, blurred vision, and cortical blindness has been reported as complications in pre-eclamptic women. Most result in transient visual loss.[2] However, the combination of blindness and pre-eclampsia remains a rare phenomenon. To our knowledge, we report the first case of central retinal vein occlusion secondary to pre-eclampsia in the puerperium.

Case report

A 20-year-old woman booked in her first pregnancy at 12 weeks gestation for antenatal care. At booking, her blood pressure was 100/55 mmHg and routine bloods were normal. In the past she had a history of a heart murmur. Being symptomatic with shortness of breath and a feeling of extra beats, formal cardiology assessment and transthoracic echocardiogram were requested and found to be normal. The remainder of her antenatal care was uneventful until 39+ weeks gestation.

At this visit her blood pressure was 130/70 mmHg and she had 2++ of proteinuria on dipstick testing. A mid-stream urine analysis from 1 week previously was clear. She also complained of bilateral leg swelling for the past 2–3 weeks. She was referred to the maternity unit for assessment. On admission her blood pressure profile ranged from 120–170/85–100 mmHg, with persistent 2++ proteinuria. She denied any headaches, visual disturbances, or epigastic pain. Examination was unremarkable with normal reflexes and fundoscopy. The baby was well grown and cardiotocography was normal. Routine pre-eclampsia blood tests (FBC, U & E's, LFT's, uric acid, and clotting) were normal apart from a raised uric acid at 0.40 mmol/l. The patient was admitted and a 24-h urine collection for protein was commenced. The following day her condition remained stable. By the second day her blood pressure was 174/88 mmHg and the 24-h urine collection result showed an elevated protein level of 1.52 g/l (normal range <0.3 g/l). Reflexes were hypereflexic with marked ankle clonus. In view of this potential impending eclampsia the decision was made to deliver. The cervix was favourable for surgical induction via forewater amniotomy. Subsequent monitoring of her blood pressure ranged from 135/78 to 186/110 mmHg. She progressed to an uneventful normal vaginal delivery of a live female infant. During labour and the postnatal period she was kept under close observation, but was not commenced on any antihypertensive nor magnesium sulphate. After 3 days she was discharged with a blood pressure of 130/80 mmHg, normalised blood tests and reducing oedema.

Approximately 3 weeks postpartum, the patient presented to the Ophthalmology Department with

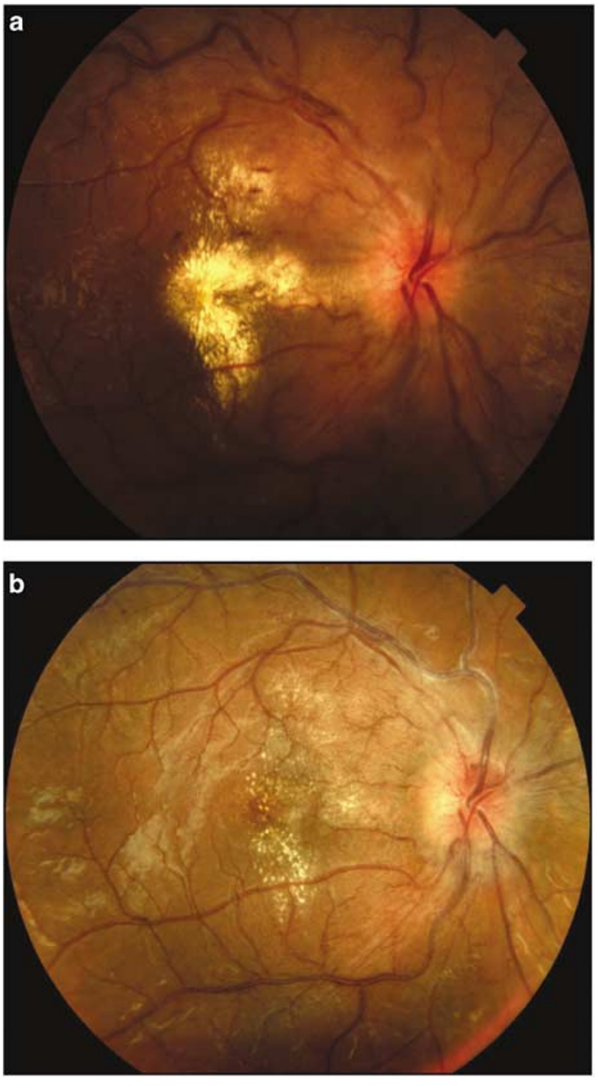

Figure 1 (a) Fundus appearance of the patient at 5 month follow-up. Note the dilated venules, scattered haemorrhages, disc swelling and gross exudation surrounding the macular. (b) Fundus appearance at 9 months showing reduced exudates and disc swelling.