

## CASE REPORTS

## Perfluorocarbon heavy liquids in the management of posterior dislocation of the lens nucleus during phakoemulsification

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### Abstract

**We report a case in which the lens nucleus dislocated into the vitreous cavity through a posterior capsular rupture during phakoemulsification. We performed a vitrectomy and removed the lens nucleus using the perfluorocarbon heavy liquid perfluoro-1,3-dimethylcyclohexane. The management of posterior dislocation of the lens nucleus during cataract surgery is discussed.**

One of the most serious peroperative complications of phakoemulsification is loss of the lens nucleus, either intact or in fragments, into the vitreous cavity. If it is left there, persistent intraocular inflammation and secondary glaucoma may ensue,<sup>1</sup> so it is desirable to remove the lens nucleus either at the time of the cataract surgery or as a secondary procedure. Hitherto three options have been available to the surgeon in this situation:

(1) Upward displacement of the lens nucleus with a viscoelastic agent. This carries the risk of vitreoretinal traction, retinal break formation, and subsequent retinal detachment and can be considered only if the nucleus is in the anterior vitreous.

(2) Vitrectomy followed by Fragmatome removal of the lens nucleus. Some nuclei may be too hard for this, and there is a risk of iatrogenic retinal damage.

(3) Vitrectomy, fluid/air exchange and removal of the lens nucleus with a long reach endocryoprobe. This too can traumatise the retina, and in addition it causes severe corneal distortion and possibly endothelial cell damage.

Perfluoro-1,3-dimethylcyclohexane (Flutec PP3, ISC Chemicals Ltd, Bristol) is a clear, colourless, non-toxic perfluorocarbon liquid<sup>2</sup> which, with a density of 1.83 g/cm<sup>3</sup>, is denser than water and the lens nucleus, both of which therefore float on it. In the case described we used it to procure the straightforward and atraumatic removal of a dislocated lens nucleus from the vitreous cavity.

### Case report

A 69-year-old woman underwent cataract extraction under general anaesthesia. She had no other

ocular pathology. A scleral pocket incision was performed followed by a continuous tear capsulorrhexis. The lens cortex was hydrodissected from the capsule and phakoemulsification begun, but early in this part of the procedure the posterior capsule dehisced, and the surgeon was unable to prevent the lens nucleus from dislocating into the vitreous cavity.

The scleral section was closed with temporary sutures, and a total vitrectomy was performed along with removal of the remaining lens cortex and capsule, by means of a standard three-port pars plana technique. The lens nucleus, then lying on the posterior retina, was freed from the residual vitreous gel with the ocutome and Flutec PP3 perfluorocarbon heavy liquid was injected via a 20 gauge cannula through one of the sclerostomies into the vitreous cavity. This elevated the lens nucleus into the anterior chamber. The wound was reopened and the lens nucleus removed easily with a vectis. Approximately 6 ml of heavy liquid was used in total. After closure of the incision Ringer's solution was passed through the infusion canula into the eye and the heavy liquid removed via a flute needle. After a pause to allow any perfluorocarbon retained in the residual vitreous gel to sink posteriorly, the exchange was completed and the sclerostomies closed. Postoperatively there was no excessive uveitis or rise in intraocular pressure, and after 4 months' follow-up the corrected visual acuity is 6/12.

### Discussion

Loss of the lens nucleus through a ruptured posterior capsule is a risk not only during phakoemulsification but also in conventional extracapsular surgery. It is a rare complication, but the consequences for vision can be devastating if phakoanaphylactic glaucoma supervenes. The incidence of glaucoma seems to increase dramatically if the lens nucleus is allowed to remain for longer than 3 weeks,<sup>3</sup> so it is our belief that the nucleus should be removed surgically within this period.

If, following posterior capsular rupture, the lens nucleus remains anterior to the capsule, it is usually possible, after clearing vitreous from the anterior chamber, to manipulate it bimanually in the iris plane (with a cyclodialysis spatula passed through an anterior chamber paracentesis) and

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remove it with the phakoprobe or fragmatome. A nucleus in the anterior vitreous can be elevated into the iris plane with a viscoelastic agent and then removed in the same way. However, a nucleus lying on or near the retina will require a different approach. The timing of this surgery depends on the state of the vitreous gel. In patients over the age of 65 years it is likely that the posterior hyaloid is detached (and the risks of vitrectomy therefore much diminished), in which case the nucleus can be removed as a primary procedure as we have described here. In younger patients anterior vitrectomy should be performed to clear vitreous from the anterior chamber, and the section closed. The lens nucleus should then be removed as a secondary procedure, preferably within 3 weeks, by which time the posterior vitreous should have detached spontaneously.

Perfluorocarbon liquids were introduced into ophthalmology in the 1980s and are used in the management of complicated retinal detachments and for epiretinal membrane dissections.<sup>4,5</sup> They are clear, colourless, and have refractive indices similar to that of normal saline. They have low viscosity and therefore pass easily through small cannulae, while their high interfacial tension hinders their passage through retinal breaks.<sup>4</sup> Perfluorocarbon liquids are non-toxic when used short-term as a surgical tool, but should not be left in the eye, as long-term toxicity has been demonstrated.<sup>6-8</sup> The use of perfluorocarbon liquids in this situation relies on their being denser than the lens nucleus; thus the nucleus is displaced anteriorly, rendering it more easily accessible for removal. We have also used per-

fluorocarbon liquids in the management of traumatic dislocation of the crystalline lens, and the technique could be used to remove a displaced intraocular lens implant, as Flutec PP3 is denser than polymethylmethacrylate (Bacon AS, Lavin JM, personal communication). It is important to stress that they cannot be used without first performing a vitrectomy.

If small fragments of lens nucleus are displaced posteriorly, then a conservative approach may be adopted. A whole nucleus or larger fragment should be removed by vitrectomy and perfluorocarbon heavy liquid used either as a primary procedure if the patient is over 65 years old, or as a secondary procedure if the patient is younger or vitrectomy facilities are not immediately available.

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