Complicated posterior capsulorhexis: aetiology, management, and outcome

Françoise Van Cauwenberge, Jean-Marie Rakic, Albert Galand

Abstract

Background—A 1 year retrospective analysis of 650 patients, who underwent a posterior capsulorhexis on their intact capsules, was performed to examine the incidence of complications, their aetiology, and the outcome.

Methods—Data were analysed on 32 patients with complicated capsulorhexis for type of surgery, preoperative and postoperative factors, and relative risk factors for vitreous issue.

Results—There were six patients with vitreous loss. The posterior capsulorhexis was uncontrolled in 14 cases and difficult to perform in 12 cases. Implantation into the capsular bag was possible in all cases. Systemic vascular hazard and old age (over 80 years) were found to be statistically significant risk factors for vitreous loss (p=0.002 and p=0.03 respectively). The mean follow up was 13.5 months (range 4–25 months). One patient developed a retinal detachment and two had a transient clinical cystoid macular oedema. Visual acuity of ≥ 20/40 was obtained in 93% of the patients.

Conclusion—Loss of control of the posterior capsulorhexis has low incidence but can lead to serious problems during surgery. A good knowledge of the technique is necessary to complete the procedure with a posterior capsulorhexis of the optimum size without vitreous loss.


‘After-cataract’ (also referred to as posterior capsule opacification or secondary cataract) is the most important challenge to modern extracapsular cataract extraction (ECCE), with an estimated incidence approaching 50% after 5 years. Most surgeons currently rely on the Nd:YAG laser to perform posterior capsulotomy at a later stage if the capsule opacifies. There are some disadvantages to YAG laser therapy including vision threatening complications, and increased overall cost of surgery including vision threatening opacifies. There are some disadvantages to YAG laser therapy including vision threatening complications, and increased overall cost of surgery including vision threatening opacifies.

Materials and methods

From a 1 year retrospective analysis of medical charts, 32 cases of complicated PCCC on intact capsules were identified in a cohort of 650 patients with PCCC (5%). Complicated PCCC was defined by the peroperative observation of vitreous passage into the anterior segment, tears in the posterior capsule, uncontrolled size or location of the PCCC, or technical difficulty in PCCC performance. These 32 cases represent all the unplanned problems encountered with the posterior capsule, and they were further analysed for type of surgery, preoperative and postoperative factors, and relative risk factors for vitreous issue.

Background ocular pathology (Table 1), where it was felt that visual outcome could be suboptimal, was present in 16 patients (50%). Table 2 gives age, sex, axial length, and preoperative intraocular pressure (IOP) characteristics. Only one case was carried out under local anaesthesia (via an inferotemporal peribulbar injection of 4 ml lignocaine 2%). The rest were operated under general anaesthesia. The surgeons performing the procedure were two of the authors (FV and AG). No device was used preoperatively to lower vitreous pressure.

After either corneal incision (90.6%) or fornix based flap (9.4%), an anterior circular...
capsulorhexis was created. This was followed by phacoemulsification (41%), nucleus reduction (28%)\(^1\), Kansas technique (19%)\(^2\), or, for patients with a very soft nucleus, irrigation aspiration only (12%). Before the insertion of an intraocular lens, a hole was created with a 30 gauge needle in the posterior capsule, viscoelastic substance was injected through the hole and a PCCC was attempted. Complications appeared and were handled as discussed below. After removal of the viscoelastic, the self sealing incision was sutured, and a drop of β blocker was immediately applied. Intravenous acetazolamide was systematically administered.

Statistical analysis of the relative risk factors involved in vitreous loss was performed with the odds ratio (OR) method and the χ² test.

### Results

A complete overview of the incidence of each type of complication is given in Table 3. The most frequent problem was to perform a central capsulorhexis of the optimum size (<5 mm diameter). This was not possible in 14 cases, and in 12 cases a PCCC was carried out with great difficulty because of either insufficient visibility during the procedure or an anatomically changed capsule (fleshy or fibrotic in its centre).

Table 4 gives the patient characteristics and the type of procedure in cases with vitreous loss. Risk factors were found to be the presence of multiple vascular problems (OR=25, χ²=9.5, p<0.002), age over 80 years (OR=9.4, χ²=4.7, p=0.03), and manual extraction of the nucleus (OR=4.2, χ²=1.8, not statistically significant). These six cases necessitated the use of anterior dry vitrectomy before the implantation of the IOL.

Tears in the posterior capsule were created during the opening of the capsule with vitreous positive pressure (one case), during injection of viscoelastic with exaggerated pressure in the PCCC (one case), and during the IOL implantation in a non-circular posterior capsulorhexis (one case).

In the 11 cases demonstrating too large and/or eccentric PCCC, the loss of control of the size and of the location of the PCCC occurred during viscoelastic injection in eight cases (viscoelastic was injected under too much pressure or with air bubbles), as a result of positive vitreous pressure in one case, poor visibility in another case, and without identifiable reason in one case.

Finally, in 12 patients, the procedure was controlled but technically difficult. The problem involved mainly the quality of the posterior capsule which was either floppy and located very deeply in the eye or fibrotic in its centre making the control difficult since the fibrotic plaque tends to direct the size and the location of the PCCC. A poor visibility during the procedure was the consequence of a damaged cornea (two cases), myotic pupil (one case), air bubbles in viscoelastic (one case), and improper position of the coaxial light as regards the position of the PCCC (one case).

In all these cases, after a thorough checkup of the capsular stability under the iris, endocapsular implantation was performed during the initial procedure.

Table 5 details the results of the examination performed on the first postoperative day. Table 6 gives the postoperative complications related to the performance of a PCCC with a mean follow up of 13.5 months (range 4 to 25). The mean IOP was 14.1 mm Hg (range 8–24) and no case resulted in chronic glaucoma. The visual performance was good (mean visual acuity of 32/40, range 20/60–60/60). Only two patients with macular degeneration had visual loss. Risk factors were found to be the presence of multiple vascular problems (OR=25, χ²=9.5, p<0.002), age over 80 years (OR=9.4, χ²=4.7, p=0.03), and manual extraction of the nucleus (OR=4.2, χ²=1.8, not statistically significant). These six cases necessitated the use of anterior dry vitrectomy before the implantation of the IOL.
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Discussion

There are currently three main strategies in the research of after-cataract prevention. The first, by analogy with the experience acquired in glaucoma, involves the application of antiproliferative drugs in the capsular bag.20 The second is oriented towards complete removal of epithelial cells from the capsule during surgery (diathermy)11 or after a latent period (toxins coupled with a specific antibody or a growth factor).1213 The third tries to preserve a clear central axis for a long period of time (IOL geometry and biochemistry,14 equatorial rings,15 removal of the central posterior capsule during the initial procedure).

Posterior capsulorhexis has been introduced in cataract surgery for paediatric cataract extraction or for extracapsular surgery complicated by capsular disruption. There are, however, no reports in the literature on the possible intraoperative or postoperative complications of these cases. We have extended the indications of this procedure to the majority of our cases presenting an intact capsule at the end of cataract extraction. Our analysis of 32 cases of complicated PCCC (due either to vitreous passage into the anterior segment, loss of control of the rhexis, or problems in obtaining a continuous circular centred rhexis) highlighted the contributing factors to the problems observed.

The only statistically significant relative risk factors for vitreous loss during the procedure were found to be systemic cardiovascular disease and age over 80 years. This is in accordance with previous studies which suggested a relation between positive vitreous pressure and coexisting vascular problems.16 Our six cases with vitreous loss necessitated the use of anterior dry vitrectomy with viscoelastics to prevent further vitreous hydration. The anterior vitrectomy was probably not complete enough since half of these cases still had vitreous in the anterior chamber the next day. Another possibility is that, even if the vitrectomy were complete, a small amount of vitreous somehow found its way towards the rhexis, or problems in obtaining a continuous circular centred rhexis)

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favourably with 77% in Gimbel's series, while half of our cases had background ocular pathology. However, a complicated PCCC in which all lens matter has already been removed is obviously an easier situation than a disruption of the posterior capsule at the beginning of the phacoemulsification.

Loss of control of the PCCC can lead to potential problems during surgery. Our analysis of 32 difficult cases suggests that old patients with serious systemic vascular disease, eyes with floppy or fibrotic capsules, and those offering us poor visibility during the procedure are not good candidates for the performance of a safe PCCC. A good knowledge of the technique, especially during the manipulation of viscoelastics around the posterior capsule is mandatory to complete the procedure with a posterior continuous centred capsulorhexis of the optimum size, without vitreous loss.

The authors thank Professor Adelin Albert of the University of Liège, for his help with statistical analysis, Professor Gis Vriens from the Netherlands Ophthalmic Research Institute, Amsterdam, for his helpful discussion, and Mr Tony Lejeune for his assistance in manuscript preparation.

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doi: 10.1136/bjo.81.3.195

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