Review Article

Managing the posterior polar cataract: An update

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Posterior polar cataracts (PPC) have always been a challenge for cataract surgeons due to their inherently higher propensity for posterior capsule rupture. Over the years, several technical modifications have been suggested to enhance safety and reduce posterior capsule rupture rates in these polar cataracts. This review article tries to present the various techniques and strategies to published in literature to manage PPCs. It also discusses pearls for making surgery more reproducible and consistent, as well as the role of newer diagnostic and surgical technology based on the published literature on the subject.

Key words: Posterior polar cataracts, posterior capsule rupture, preexisting posterior capsule dehiscence

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Posterior polar cataracts (PPCs) are known to be associated with an abnormal adhesion of the posterior capsule to the polar opacity, or a preexisting weakness of the posterior capsule, both of which predispose the eye to posterior capsule rupture (PCR) during cataract surgery. PPCs are, therefore, a nightmare for all cataract surgeons, and several strategies are being propagated to reduce the PCR rate in these cataracts.

The aim of this review article is to provide the reader with a comprehensive overview of surgical strategies to deal with emulsification of PPCs. It will provide readers with methods to avoid and/or deal with intraocular surgical difficulties that can arise during emulsification. Employing these would result in least ocular morbidity and satisfactory visual outcomes for the patient.

Methods of Literature Search

For the purpose of this review, a PubMed and Medline search of the relevant literature on PPC was done. Keywords used for the search were: posterior polar cataract, surgery, phacoemulsification, techniques, genetics of posterior polar, femtosecond laser, and PCR. For this review, primarily only those articles relevant to the surgical management of PPC were included in this study.

Clinical Presentation of Posterior Polar Cataracts

PPCs have a distinct morphology, and present with a white, central opacity on the posterior capsule with multiple concentric layers, resembling a bull's eye appearance [Fig. 1]. Depending on the clinical presentation, PPC can be divided into three categories: (1) PPC with imminent posterior capsule dehiscence, (2) PPC with preexisting posterior capsule dehiscence [Fig. 1], (3) Spontaneous dislocation. We studied our clinic-based population, (unpublished data) where we examined 79 patients undergoing surgery for PPC between 2009 and 2010. In this group, 77of 79 (97%) eyes displayed PPC with imminent dehiscence; 2 of 79 (3%) eyes had PPC with preexisting posterior capsule dehiscence.

The common symptom is glare disability in photopic illumination conditions. Two types of PPC have been described in literature: stationary and progressive.[1] Stationary PPC is characterized by the classical central, opacity with concentric rings around the central plaque. The opacity has a cone-shaped projection in the subcapsular region or central posterior cortex. This type of PPC is compatible with good vision. Patients with progressive opacity become more symptomatic as the peripheral extensions of the central plaque enlarge [Fig. 2]. Schroeder[2] has graded PPCs in his pediatric patients according to its effect in pupillary obstruction in the red reflex.

In our clinic, we found that the average age of patients presenting with PPCs was 50.67 years, with a wide range from 27 to 63 years (unpublished data). It was also noted that PPC was bilateral in 90% of our cases, and has been reported to be bilateral in 70% cases in a previous study by Gavriş *et al*.[3]

Ocular and Systemic Associations of Posterior Polar Cataracts

Coexisting systemic or ocular anomalies have not been reported in literature, except for a report of retinitis pigmentosa in eyes

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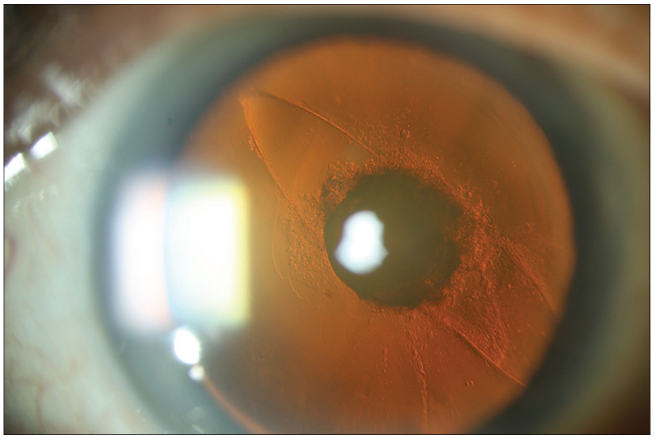

Figure 1: Posterior polar cataract with a preexisting dehiscence in the posterior capsule

with PPC.[4] Nada *et al*.[5] also reported two children under the age of 3 years with unilateral Wilms tumor, aniridia, and PPC. Several gene mutations have been found to be present in different populations with congenital and familial PPCs.[6-17] Although most cases of PPC are sporadic, an autosomal dominant inheritance has also been reported.[18,19]

Risk of Posterior Capsule Rupture during Cataract Surgery

The reported incidence of PCR during PPC surgery is variable, with older studies reporting an incidence as high as 36%,[20] and 26%,[21] to recent studies reporting 6%–7%[22] and even as low as 4%.[23] With a better understanding of surgical techniques, improving technology and increasing surgical experience, the incidence of this complication has been reduced. However, till date, there is no surgical strategy that can eliminate the occurrence of PCR in a PPC. Phacoemulsification has been shown to be superior to extracapsular cataract emulsification in terms of safety during surgery.[24]

Kumar *et al.* evaluated the association of size of the polar opacity with the occurrence of PCR during surgery. They reported that polar opacities that measured >4 mm in diameter had a higher chance of PCR compared to those <4 mm.[25] Further, age younger than 40 years has also been reported to be an independent risk factor for PCR.[24]

Preoperative Evaluation and Counseling

A thorough anterior and posterior segment evaluation, particularly evaluating the integrity of the posterior capsule is essential before planning surgery. Associated types of cataracts, such as nuclear sclerosis or cortical cataracts should be noted. Often, in the presence of a total white cataract, the presence of a polar opacity in the fellow eye may give an important clue to the surgeon. The patient and their caregivers need to be counseled carefully regarding the increased risk of a PCR or nucleus drop and the possibility of a retinal intervention as well as prolonged surgical duration.

Often, these cataracts maybe associated with posterior capsular plaque, necessitating neodymium-yttrium-aluminum-garnet (Nd:YAG) capsulotomy which should be explained to the patient.[20-22] Unilateral PPCs, particular

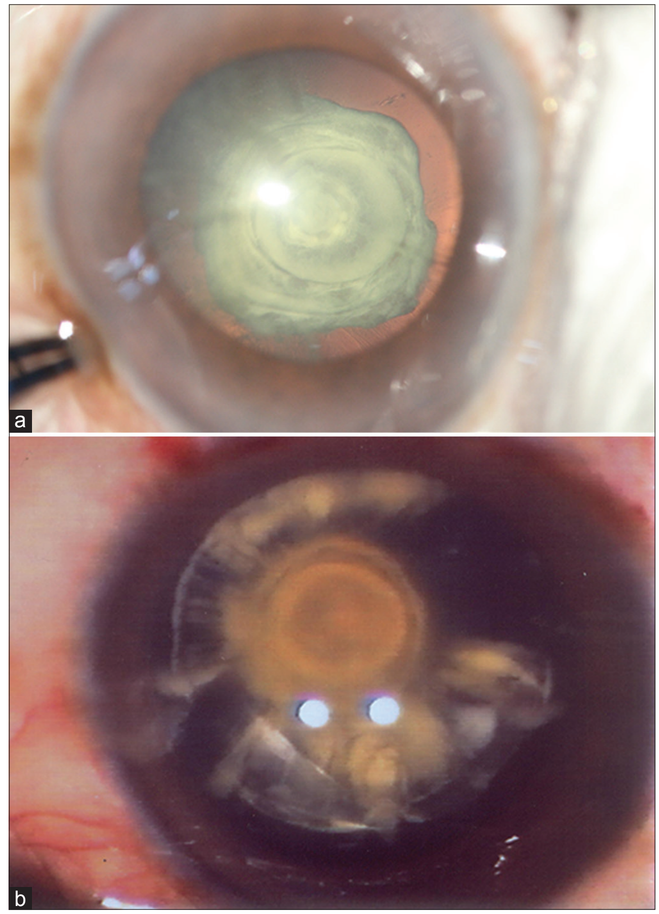

Figure 2: (a and b) Progressive type of posterior polar cataracts. Changes take place in the posterior cortex in the form of radiating rider opacities

those from childhood may be associated with amblyopia and therefore visual prognosis maybe guarded.[22]

Role of Anterior Segment Imaging in Posterior Polar Cataracts

Modern imaging techniques are revolutionizing pre-, intra-, and post-operative patient management. Of particular interest is the optical coherence tomography (OCT), which allows the surgeons to visualize the integrity of the posterior capsule. This can be extremely useful in planning the surgical strategy as well as counseling the patient regarding the additional risk of PCR during surgery. Chan *et al*.[26] used OCT imaging to grade PPCs and judge the presence or absence of PCR. Similarly, Kymionis *et al*.[27] reported a series of three cases with PPCs where the OCT helped to judge the status of the posterior capsule before surgery. Recently, the intraoperative OCT is becoming popular. This technology has the potential to change surgical techniques as well as surgeons' perspective due to its ability to give real-time dynamic changes occurring during surgery. Titiyal *et al*.[28] reported the use of a microscope mounted intraoperative OCT system to visualize integrity of the posterior capsule in PPCs. However, it should be kept in mind that the anterior segment OCT cannot definitively diagnose a rupture or a thin posterior capsule in every case.

Surgical Approach in the Absence of a Visible Posterior Capsule Defect

Intracapsular cataract extraction

Except for a single case, in a series of 28 eyes of 20 consecutive patients with PPC,[22] there is no evidence for or against this approach. This approach was used by the authors in an eye with a large opacity and hard nucleus. However, intracapsular cataract extraction is not a preferred approach anymore.

The posterior approach

The rationale behind using pars plana lensectomy and vitrectomy was to eliminate the risk of an unexpected capsular rupture and posterior segment complications.[29] This approach was investigated in an interventional case series of 11 eyes of 8 patients. During a mean follow-up of 13 months, 3 of 11 eyes developed posterior segment complications. This approach was also used in 2 of 28 eyes undergoing surgery for PPC. The authors had used this technique as the opacity was large and the lens soft.[22] This approach can, however, be associated with complications associated with vitrectomy.

The anterior approach using phacoemulsification

The goals of performing phacoemulsification in eyes with PPC are to maintain the barrier of the irido-zonular-capsular diaphragm between the anterior and posterior segments and to implant an intraocular lens (IOL) in the bag. Surgical techniques that provide a closed chamber during all the stages of phacoemulsification can maintain the contours of the cornea and the globe. This reduces the risk of intraoperative PCR in eyes with PPC. A number of surgical approaches have been proposed for emulsification of PPC.[30-36] We here highlight the surgical principles that most techniques propagate during emulsification of PPCs.

Incision

Most surgeons today prefer clear corneal or near clear corneal incisions. Self-sealing incision architecture is crucial to maintain a closed chamber both during and after surgery. The smallest incision size compatible with the surgeon's technique and phaco tip/sleeve should be used. It is important that all incisions are valvular and nearly square in architecture. We recommend creating an initial paracentesis incision, followed by injection of an ophthalmic viscosurgical device (OVD) to form the chamber before making the main incision. This avoids sudden shallowing of the chamber or forward bulge of the iris-lens diaphragm. However, Fine *et al*.[37] caution against over-injection of OVD since increasing the pressure in the anterior chamber could cause a blow-out of the posterior capsule. Haripriya *et al*.[33] recommend performing bimanual microcincision phacoemulsification to maintain a closed anterior chamber during surgery.

Capsulorhexis

It is important to fashion an adequately sized anterior continuous curvilinear capsulorhexis (ACCC). An adequate size would be somewhere around 5 mm. Since most of these cataracts are soft, too small a rhexis makes prolapse of nucleus into the anterior chamber difficult. On the other hand, a larger opening may not provide adequate support for a sulcus-fixated IOL in case the posterior capsule is compromised.[20,37] Singh[38] recommends performing an oval capsulorhexis for PPCs, particularly those with a preexisting PCR, as he believes it allows greater efflux of fluid from the bag and end-to-end nucleotomy along with easy nuclear fragment removal in PPCs. Now, with the advent of the femtosecond lasers and other devices such as the precision pulse capsulotomy, it is possible for surgeons to create a customized size, shape, and centration of CCC.[39-42]

Hydroprocedures

Cortico-cleaving hydrodissection[31] can lead to hydraulic rupture and should be avoided.[20,21] It would be logical to perform hydrodelineation to create a mechanical cushion of the epinucleus.[4,20,21,30,43] Masket,[44] Hayashi *et al*.,[22] Allen and Wood,[30] and Lee and Lee[32] recommend hydrodelineation. In addition to hydrodelineation, Fine *et al*.[37] also perform hydrodissection in multiple quadrants injecting tiny quantities of fluid gently, such that the fluid wave is not allowed to spread across the entire posterior capsule. With conventional hydrodelineation, the cannula penetrates within the lens substance causing the fluid to traverse from outside to inside. It is sometimes difficult to introduce the cannula within a firm nucleus, as it can cause stress to the capsular bag and zonules. There is also a possibility of the fluid being injected inadvertently in the subcapsular plane, leading to unwarranted hydrodissection.

Inside-out delineation

"Inside-Out Delineation" technique differs from conventional hydrodelineation in that it can precisely delineate the central core of the nucleus.[45] Following ACCC, a central trench is sculpted using the slow-motion technique,[46] taking care that there is no mechanical rocking of the lens. A dispersive OVD (Viscoat, Alcon Laboratories, USA) is injected through the paracentesis before retracting the probe to avoid a forward movement of the iris-lens diaphragm. A specially designed right-angled cannula is introduced through the main incision and the tip is placed adjacent to the right wall of the trench at an appropriate depth, depending on the density of the cataract. It then penetrates the central lens substance and fluid is injected through the right wall of the trench [Fig. 3a]. Delineation is produced by the fluid traversing inside-out. A golden ring within the lens is evidence of successful delineation [Fig. 3b]. Fluid injection may be repeated in the left wall of the trench with another right-angled cannula. The trench allows the surgeon to reach the central core of the nucleus [Fig. 4]. As fluid is injected at a desired depth, under direct vision, a desired thickness of epinucleus cushion can be achieved. It provides a precise epinucleus bowl that acts as a mechanical cushion to protect the posterior capsule during subsequent maneuvers [Fig. 4]. Inside-out delineation is easy to perform, provides superior control, reduces stress to the zonules, and precisely demarcates the central core of the nucleus.

Rotation

Any attempt to rotate the nucleus can lead to PCR and is best avoided.[20]

Division and fragment removal

The aim is to remove as much nucleus as possible within the cushion of the epinucleus to protect and tamponade the posterior capsule. Bimanual cracking and division of the nucleus involve outward movements and can result in distortion of the capsular bag. In nuclear sclerosis < Grade 2, the demarcated nucleus is emulsified by creating adjacent trenches to create

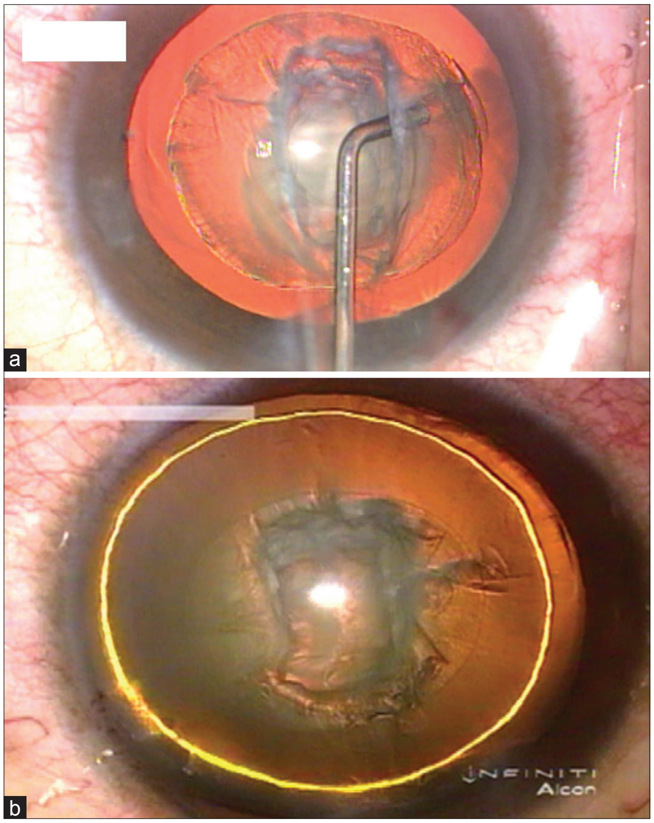

Figure 3: (a) Demonstrates technique of inside-out delineation. (b) A golden ring within the lens is evidence of successful delineation

a bowl. The delineated nucleus is emulsified within the cushion of the epinucleus. In nuclear sclerosis of > Grade 2, we use the step-by-step, chop *in situ*, and lateral separation technique.[47] Traction of the posterior lens fibers and posterior polar opacity during surgery are enough to break the weak posterior capsule. The slow-motion technique with low irrigation and aspiration (I/A) parameters is recommended to reduce turbulence in the anterior chamber.[48] The collapse of the anterior chamber and forward bulge of the PC is prevented throughout the procedure by injecting a dispersive OVD before withdrawing any instrument.[20]

Lee and Lee[32] use the lambda technique to sculpt the nucleus, followed by the creation of a crack along both arms, and removal of the central piece. In dense nuclear sclerosis, Lim and Goh[49] suggest prechopping the anterior epinucleus before mobilizing, segmenting, and emulsifying the dense endonucleus. Kamoi and Mochizuki[36] advocate the "predivision" technique, where a prechopper is used to create two prechops on either side of the center, and a central fragment is removed thereafter, providing space in the capsular bag for further manoeuvres. Chee[34] suggests the technique of manual disassembly of nucleus in cases of PPC with associated dense nuclear sclerosis. Here, a deep trench is sculpted following hydrodelamination. Thereafter, a Nagahara chopper is used to partially crack the nucleus into quadrants without nuclear rotation. Next, the phaco tip engages the nuclear material, and the tip of chopper creates a cleavage plane to an estimated depth which leaves a nuclear shell so that the polar opacity is protected until the later stages. Nagappa *et al*.[35] recommend

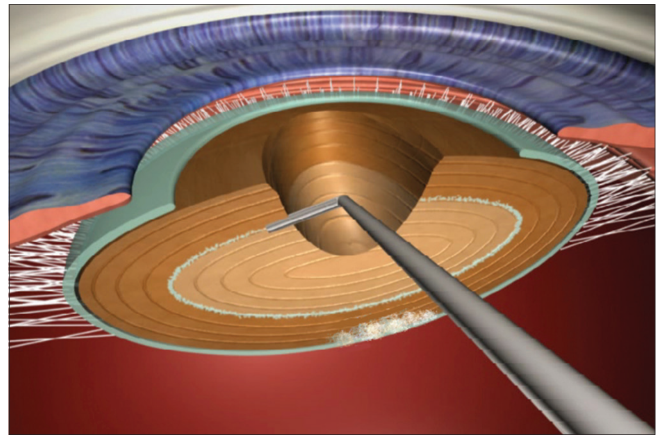

Figure 4: Graphical representation of inside-out delineation. The residual epinucleus bowl provides mechanical protection (cushion effect) to the polar opacity during emulsification of the nucleus

phaco-aspiration for the distal epinucleus and hydrodissection for subincisional epinucleus, once a cleavage plane has been created.

Epinucleus removal

Epinucleus removal is one of the most difficult parts of PPC emulsification. The first step should be to cleave the epinucleus from the capsular fornices and the second step is to aspirate it. The epinucleus in the 180° opposite the main incision, is stripped off the capsule with the phaco tip, using very low aspiration flow rate (14–16cc/min), vacuum (150–200 mmHg), ultrasound (US, 15%–20% preset energy), and bottle height (70–80 cm). At this point, no attempt is made to aspirate the entire epinucleus, it is only detached from the capsular fornices, leaving the central area attached.[20,37,44] For cleaving the subincisional half of the epinucleus, focal, multi-quadrant hydrodissection with special angled cannulae is performed [Fig. 5]. The fluid wave travels along the cleavage formed between the capsule and the lower epinucleus. It does not threaten the integrity of the posterior capsule. Moreover, it is safe to hydrodissect as the capsular bag is not fully occupied. Therefore, the hydraulic pressure built-up is not sufficient to rupture the posterior capsule. The entire epinucleus is then aspirated, finally detaching the central area. Allen and Wood[30] and Fine *et al*.[37] suggest viscodissection of the epinucleus performed by injecting an OVD under the capsular edge to mobilize the rim of the epinucleus. This eliminates the possibility of a fluid wave or buildup of hydraulic pressure. The epinucleus can then be removed with a coaxial I/A handpiece. Lee and Lee[32] perform manual dry aspiration with the Simcoe cannula. Nagappa *et al*.[35] state that rather than just cleaving the distal epinucleus, they perform phaco-aspiration and removal of the epinucleus in the quadrant opposite to the section. Then hydrodissection is performed to release the adhesion of the subincisional epinucleus from the cortex.

Highly dilute fluorescein dye has been used intracamerally to stain the epinucleus and the remaining ring-like opacity.[50] The authors observe that staining the epinucleus could aid in careful cortical aspiration without causing damage to the intact posterior capsule. We speculate that in the event of an unidentified breach of the posterior capsule, injecting a dye may cause undesirable percolation into the vitreous.

Pseudohole

At times, the posterior cortex displays a classical appearance suggestive of a defect. If the posterior capsule underneath this opaque ring is intact, it is termed as a "pseudohole" [Fig. 6]. Nagappa *et al*.[35] have coined the term "fish mouthing" as a sign of posterior capsular rupture where the vitreous is seen coming through the PPC.

Cortex removal

Bimanual automated I/A optimizes control, ensures anterior chamber maintenance, and aids in the complete removal of the cortex. Fine *et al*.[37] use coaxial I/A and use OVDs to protect the posterior capsule during cortex removal.

Posterior capsule vacuum polishing

It is avoided even if the posterior capsule is intact due to its fragile nature.[20-22,37,44] Instead, postoperative Nd:YAG laser posterior capsulotomy is preferable. An Nd:YAG capsulotomy maybe preferred at least 4–6 weeks postoperatively since the blood aqueous barrier stabilizes by this time.

Femtosecond Laser-Assisted Cataract Surgery in Posterior Polar Cataracts

Today, femtosecond laser technology for cataract surgery is gaining popularity worldwide. Its advantages and disadvantages are a subject of interest and controversy, and more and more literature regarding this technology is now coming up. Femtosecond laser-assisted cataract surgery is now also being reported for special situations such as pediatric cataracts, phacomorphic glaucomas, subluxated, and traumatic cataracts.[51-55]

The use of femtosecond lasers during PPC surgery has been reported.[23,56,57] We reported the use of this technology to enhance safety and reduce PCR rates in PPCs– the technique of femtodelineation.[23]

Surgical technique of femtodelineation

As a first step, the laser machine is docked onto the patient's eye. For nucleus division, the cylindrical pattern is chosen. The number, depth and the width of the concentric cylinders are chosen by the surgeon, guided by the live anterior segment OCT view. We create 3 cylinders within the lens, with a diameter of 5.5 mm for the outermost cylinder [Fig. 7].

As the laser fires, it creates the capsulotomy as the first step. Next, it creates 3 cylinders within the nucleus. This demarcates the lens into 3 distinct layers, surrounded by an outermost layer of epinucleus [Fig. 8]. The preset laser energy usually depends on the amount of nuclear sclerosis. The highest possible spot and layer separation should be used. The width of the cylinders can be modified manually, and we choose to keep an offset of at least 500 μm from the posterior capsule based on the OCT view to prevent any inadvertent damage to the posterior capsule.

The patient is now shifted to the operating room, where the rest of the procedure is performed under the operating microscope. The uniqueness of this technique is that no form of hydroprocedure is required. Starting from the innermost layer, each of the sharply delineated layers is emulsified from inside out within the cushion of the outer layer [Fig. 9]. Emulsification uses a low aspiration flow rate of 14–16 cc/min, minimal US energy, and a modest bottle height of 60–70 cm.

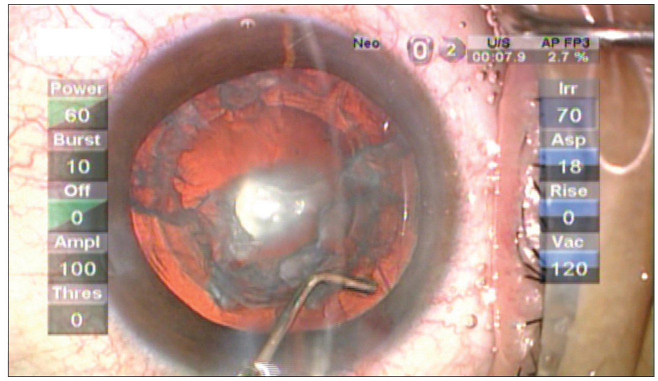

Figure 5: Cleaving the subincisional epinucleus using focal and multiquadrant hydrodissection

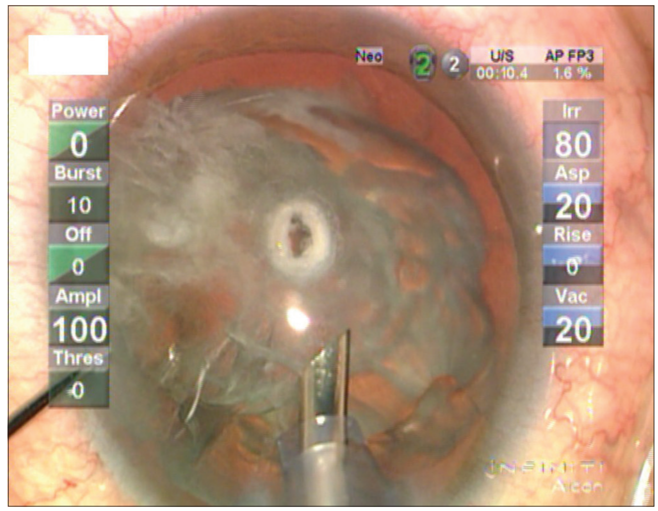

Figure 6: A pseudohole suggestive of a defect in the posterior cortex but the posterior capsule remains intact

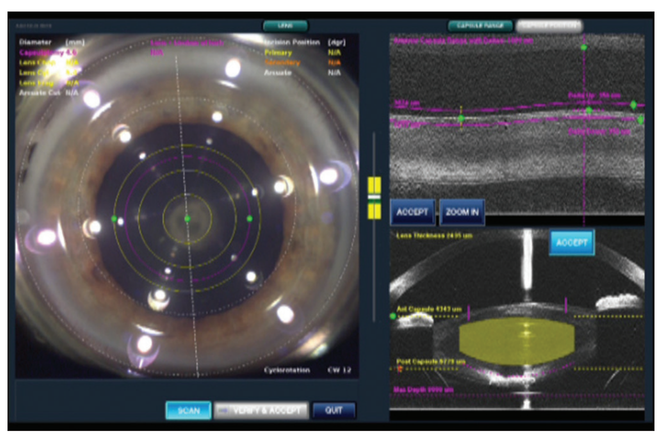

Figure 7: The femtosecond laser is programmed to create 3 cylinders within the lens. The depth and width of these cylinders is decided based on the anterior segment view

At the end of nucleus removal, a thick and uniform epinuclear cushion remains. Because of the sharp vertical wall created by the laser circumferentially, the epinuclear cushion is easily removed. It is gently stripped from the capsular bag fornices in the two quadrants (180°) directly opposite the phaco tip

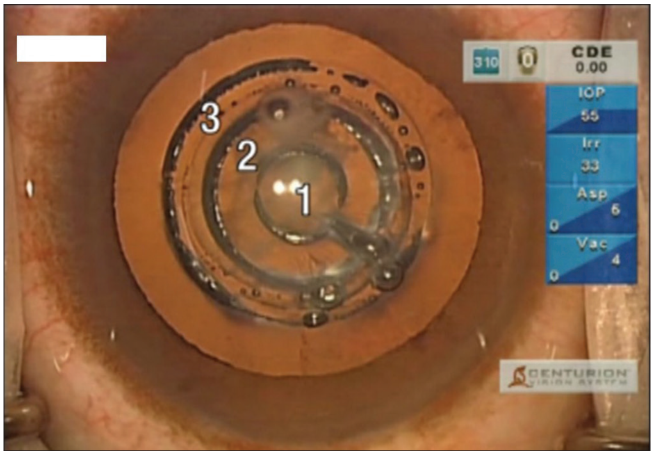

Figure 8: Following the laser procedure, there are now three cylinders, which divide the lens into four layers or zones which are sharply demarcated from each other

using a low aspiration flow rate of 14–16 cc/min, a vacuum of about 200 mm Hg, and minimal US energy. At this stage, the epinucleus is detached from the fornices only, and no attempt is made to aspirate it in the center.

One of the most crucial steps in PPC emulsification is the removal of the epinucleus and cortex. Bimanual I/A is preferred as it allows easy access circumferentially to the capsular bag, causes minimal incision distortion, and allows the maintenance of a closed chamber. Due to the sharply cut vertical walls of epinucleus with the laser, there are no free fibers available for occlusion. The aspiration probe should be placed in the fornices the subincisional 180° of epinucleus is gently stripped off the fornices with bimanual I/A. Once the epinucleus is stripped off circumferentially, it is gently aspirated.

In a prospective interventional case series,[23] femtodelineation was performed in 45 consecutive eyes of 45 patients with PPCs having cataract surgery for PPCs. A PCR occurred in 2 eyes (4.4%), which is so one of the lowest reported PCR rates in PPC.

In essence, femtodelineation allows the creation of a mechanical cushion without using any hydroprocedure. It creates multiple nuclear layers or zones that act as shock absorbers during surgery. They prevent the transmission of mechanical forces as well as fluidic turbulence to the weakest part of the posterior capsule until the end of surgery. The advantage of femtodelineation over manual hydrodelineation techniques is that it creates multiple, customized, and precise layers within the nucleus. With conventional hydrodelineation, there is a risk for inadvertent cortical cleaving hydrodissection as the injection plane is not controlled. The inside-out delineation technique,[7] on the other hand, enables better titration of the depth of the delineation but produces only a single layer of cushioning. Further, unlike the manual techniques, with femtodelineation, the size, number, and depth of the cylinders can be customized by the surgeon based on the size of the pupil as well as the capsulorhexis or surgeon comfort. If there is a preexisting or intraoperative PCR, there is no or minimal enlargement of the rupture. As a result, the final goal of implanting an IOL in the capsular bag can be achieved

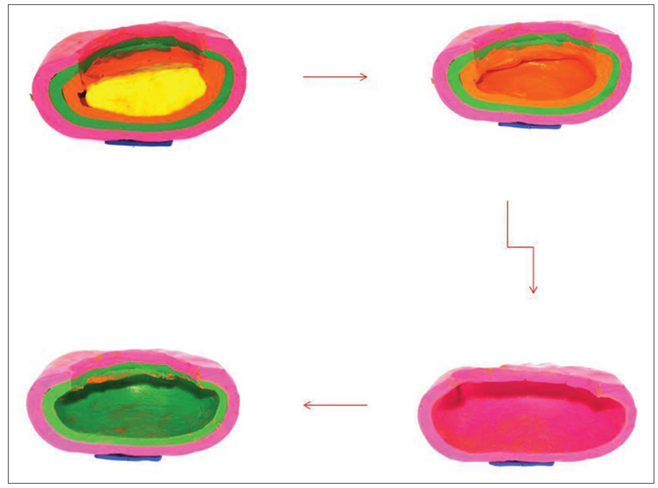

Figure 9: A clay model depicts how, each femtodelineated layer of the lens is removed while the outer layer still provides a mechanical cushion. Till the very end of nucleus removal, this protects the weak part of the posterior capsule

by converting the small rupture into a posterior continuous curvilinear capsulorhexis (PCCC).

Titiyal *et al.*[56] applied the hybrid pattern of lens division, that is a combination of chop and cylinders in 25 eyes of 20 patients using the femtosecond laser during PPC surgery. They too reported that the femtosecond laser seems to confer additional safety, and none of the eyes in their series developed an intraoperative PCR.

In another case report, Alder and Donaldson[57] reported two cases of PPCs where femtosecond laser-assisted nuclear division was performed, along with hydrodissection. The authors report a PCR in both eyes, and therefore, suggest that manual phacoemulsification with hydrodelineation may be preferable. This article highlights the fact that the basic principles of avoiding a PCR in PPCs should be adhered to, that is, avoiding hydrodissection, even when performing FLACS.

However, in summary, it is fair to say that with appropriate energy settings, femtosecond laser cataract surgery may offer a safer surgical approach to PPCs.

Surgical Approach in Eyes with a Preexisting Defect in the Posterior Capsule

The anterior approach

In an attempt to maintain anterior intact vitreous face (AVF) in eyes, the authors follow the same paradigms as those used in eyes with an intact posterior capsule. Dispersive OVD is injected over the area of the capsule defect before the phaco or I/A probe is withdrawn from the eye.[58] The Viscoat® (Alcon Laboratories, USA) tamponades the vitreous face and prevents it from prolapsing. The presence of vitreous in the anterior chamber mandates anterior vitrectomy. A two-port pars plana anterior vitrectomy, or a bimanual limbal anterior vitrectomy is then performed. Here, the use of preservative-free triamcinolone acetonide injected in the anterior chamber to detect any residual strands is very useful, and it ensures a complete vitrectomy. Once the anterior chamber is free of vitreous, the cortex is aspirated by bimanual I/A. A PCCC may be performed if the rupture is confined to a small central area.[59] High-viscosity OVD is injected around the area of the initial puncture to achieve a flat or concave capsule.[60,61] The ends of the tear are grasped with microforceps and moved circumferentially to create a circular opening in the posterior capsule. The end result should be a PCCC concentric to and smaller than the ACCC. Vajpayee *et al*.[62] performed "layer-by-layer" phacoemulsification in eight patients with preexisting posterior capsule defects. Vitrectomy was not required in any eye, and the authors found a vertical posterior capsule defect with an intact AVF in all eyes.

Site of intraocular lens implantation

In eyes with a posterior capsule defect, in-the-bag IOL implantation can be considered only if PCCC is achieved. In eyes with a large posterior capsule defect, the IOL could be placed in the ciliary sulcus, provided there is adequate ACCC support. The haptics can be placed in the ciliary sulcus and the optic maybe captured through the ACCC. However, when placing an IOL in the ciliary sulcus, it should be kept in mind that a three-piece IOL design is the best option, and the IOL power should be adjusted keeping in mind the change in the IOL position. Other options for IOL fixation are open-loop anterior chamber, a scleral-sutured posterior chamber, an iris-sutured posterior chamber IOL, or a glued or glueless intrascleral fixation of IOL.

Surgical Approach in Eyes with a Spontaneous Dislocation

The clinical impression is that prolonging cataract extraction in an eye with PPC can lead to spontaneous rupture of the posterior capsule and subluxation of the lens into the vitreous.[63,64] It is hypothesized that an increase in the size of the lens from nuclear sclerosis may cause increasing pressure on the posterior capsule, which subsequently ruptures because of its inherent abnormal weakness and could be a risk factor for spontaneous dislocation.[63] In such eyes, a posterior approach is preferred for lensectomy through the pars plana.

Posterior Polar Cataract in Children

PPC has been identified in 7% of eyes of children undergoing congenital cataract surgery.[64] The mean age of the children in this group at the time of surgery was 6 ± 3 years. In another study on 33 patients aged 1 week to 8 years with lens opacities, three patients (9%) had PPCs.[65] Unlike adult eyes, PPC occurs as unilateral cataract in a majority of pediatric eyes (93%).[64] Grading the severity of infantile cataracts has been proposed as a clinical guide to decide surgical intervention.[41] Using these criteria, PPC with a grade of 6 was considered for surgical removal. The preexisting defect seen in the eyes of children with congenital cataract is a different entity and does not appear to be a manifestation of an association with polar cataract. In our case series of 400 eyes that underwent cataract surgery for congenital cataract, a defect was present in 27 eyes (7%).[66] The preoperative diagnostic signs of a preexisting posterior capsule defect in children include a well-demarcated defect with thick margins, chalky white spots in a cluster or a rough circle on the posterior capsule, and white dots in the anterior vitreous that move with the degenerated vitreous such as a fishtail sign.[66-70] The surgical paradigms for cataract surgery in the eyes of children with PPC remain essentially similar to those used in adult eyes.[66] In eyes with PPC, an improvement in visual acuity (20/40 or better) has been noted in 84% of children after surgery.[64]

Summary

PPCs pose a challenge to surgeons. With modern technology and a better understanding of surgical techniques, outcomes of surgery can be improved. Principles that should be adhered to during PPC surgery are:

- Avoid rapid buildup of hydraulic pressure in the capsular bag
- Mechanically cushion the polar opacity during surgery
- Low aspiration and flow parameters
- Prevent sudden shallowing of chamber and forward bulge of iris-capsular bag diaphragm.

In the event of PCR, optimum management by performing a PCCC wherever feasible and complete removal of the vitreous from the anterior chamber will ensure reproducible outcomes time after time.

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Conflicts of interest

There are no conflicts of interest.

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