

Planned posterior assisted levitation in severe subluxated cataract: Surgical technique and clinical results

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We report the surgical technique and outcome of planned posterior assisted levitation (P-PAL) in four cases of subluxated cataract. P-PAL was planned as the preferred approach in all cases. A spatula was inserted via the pars plana, the whole lens was lifted to the anterior chamber and then removed through a scleral tunnel incision. Anterior chamber intraocular lenses were implanted in all cases. All four eyes had severe subluxation of the crystalline lenses with marked phacodonesis. Two eyes had history of blunt trauma, and the other two eyes had severe pseudoexfoliation with spontaneous lens subluxation. Follow-up ranged from 1 to 2 years in three cases. The postoperative visual acuity was 20/80 or better. No intraoperative complications were observed. In conclusion, the P-PAL technique was successfully performed during cataract surgery in four eyes with severe subluxated cataracts. There were no complications over the long-term follow-up.

Key words: Planned posterior assisted levitation, posterior assisted levitation, subluxated cataract, zonular dialysis

Cataract surgery in a patient with subluxated lens due to trauma, zonular dialysis, or generalized weakness of zonules can be very challenging. Phacoemulsification, with or without inserting a capsular tension ring into the bag, can be used to remove cataracts in the presence of limited zonular support. In cases of severe lens subluxation and very limited zonular support, there are three approaches for this operation as follows. (1) The posterior approach via pars plana lens fragmentation. The disadvantage of this option is the need for posterior segment surgery and postoperative complications involved with posterior segment operations. (2) The anterior approach via cryo intracapsular cataract extraction (ICCE). This method is largely unused because of the large corneal incision needed and the high rate of intraoperative and postoperative

complications. (3) The phacoemulsification approach using appropriate parameters depending on the grade of cataract.^[1] We propose an alternative method, using planned posterior assisted levitation (P-PAL) as a preferred approach to remove subluxated cataracts. Posterior assisted levitation (PAL) is a well-known emergency technique for managing an imminent dropped nucleus or lens during cataract surgery.^[2-4]

Materials and Methods

Four eyes with severe subluxation of the crystalline lenses (i.e. 6 or more clock hours involved) [Fig. 1] and marked phacodonesis were included. Two eyes had history of blunt trauma, and the other two eyes had severe pseudoexfoliation (i.e. diffuse exfoliative material on the pupillary border and peripheral anterior lens capsule) with spontaneous lens subluxation [Table 1].

In all the cases, cataract surgery was performed under general anesthesia and all the procedures were performed by one surgeon. A 6 mm sclerocorneal tunnel incision was made about 2 mm behind the limbus. Two paracentesis side ports were made at the 3 and 9 o'clock meridian, and another side port was made at the 6 o'clock meridian for an anterior chamber maintainer (ACM).

A viscoelastic agent, Viscoat® (sodium hyaluronate 3.0%–chondroitin sulfate 4.0%; Alcon Laboratories, Inc., Fort Worth, TX, USA), was injected via the side port into the anterior chamber to protect the cornea and to minimize forward prolapse of vitreous into the anterior chamber. A disposable 1.3-mm, 20-gauge microvitrectomy blade V-Lance knife (Alcon Surgical, Fort Worth, TX, USA) was used to perform a pars plana sclerotomy, 3.5 mm posterior to the limbus. Limited anterior chamber vitrectomy was used if needed. A 1-mm wide spatula (STORZ E706, Bausch and Lomb, Rochester, NY, USA) was inserted through this sclerotomy into the vitreal cavity and placed behind the lens. The lens (cum capsule) was pushed and lifted forward into the anterior chamber by the spatula [Fig. 2]. A sheet glide was introduced through the sclerocorneal tunnel incision and positioned under the lens and over the pupil to secure the lens in the anterior chamber, thus allowing safe removal of the spatula through the sclerotomy. The lens was then removed from the eye by gapping the sclerocorneal tunnel using an ACM [Fig. 3]. The sclerocorneal tunnel was enlarged till 7.5 mm (case 1) or 8 mm (cases 2–4). Anterior vitrectomy was performed after lens delivery through the paracentesis incision at the limbus to remove any vitreous that was present in the anterior chamber. The sclerotomy was closed with a single interrupted 7-0 polyglactin (Vicryl) suture. An anterior chamber IOL was implanted in all cases, and peripheral iridectomy (PI) was performed [Fig. 4]. The scleral tunnel was sutured with several 10/0 nylon sutures.

Results

The postoperative follow-up ranged from 1 to 2 years in three cases. Patient 3 died 1 month after surgery from causes unrelated to the procedure. The best corrected visual acuity (BCVA) at the last follow-up visit was 20/80 or better in all eyes. There were only slight early postoperative complications, including transient high intraocular pressure (IOP) (52 mm Hg), corneal erosion, and mild diffused vitreous hemorrhage, which all resolved within a few days after the operations. No retinal

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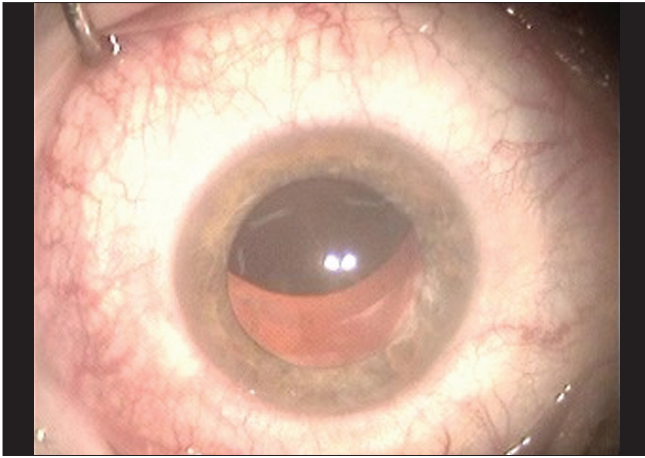


Figure 1: Preoperative examination of Patient 4, showing a severe subluxation of the crystalline lens

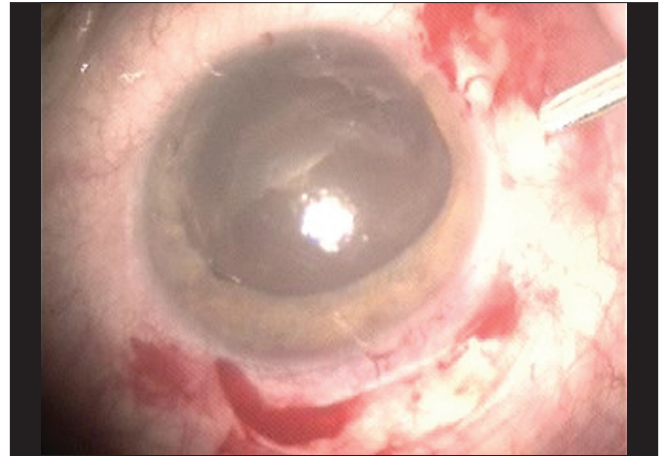


Figure 2: A spatula (arrow) is inserted via the pars plana and the whole lens is lifted to the anterior chamber

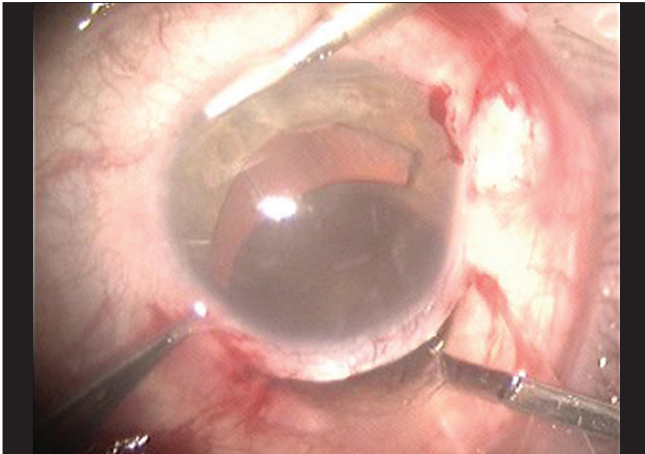


Figure 3: A sheet glide is introduced through the sclerocorneal tunnel and the lens is then removed from the eye by gapping the sclerocorneal tunnel using an ACM

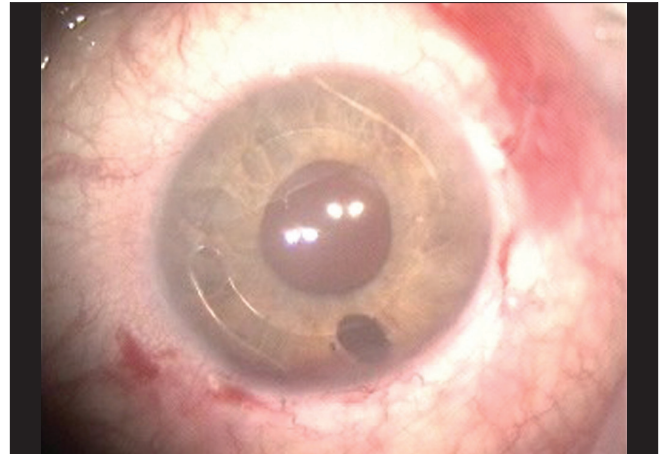


Figure 4: Postoperative examination of Patient 4, showing an anterior chamber IOL with a PI

tears, holes or detachment were identified by biomicroscopy and indirect ophthalmoscopy during the follow-up period [Table 1].

Discussion

In adults, subluxated cataracts may be accompanied by a rock-hard nucleus with pseudoexfoliation or a history of traumatized eye which can make removal of the lens from the eye very challenging.

In 1978, Kanski^[5] described intracapsular cryoextraction associated with anterior vitrectomy in four cases. In 1979, Peyman *et al.*^[6] used a cryoprobe through a limbal incision and vitrectomy. In subsequent years, pars plana and/or limbal lensectomy and vitrectomy associated with IOL implantation in the anterior chamber were used. In 1999, Lee *et al.*^[7] advocated intracapsular cataract extraction and anterior chamber IOL implantation, while Tsai *et al.*^[8] proposed pars plana lensectomy followed by transscleral fixation of a foldable IOL. Several complications were reported, such as retinal detachment, massive vitreous loss, expulsive hemorrhage, and lens loss into

the vitreous cavity. Recently, the use of a capsular tension ring with one or two fixation eyelets for suture fixation, or a capsular tension segment to ensure capsular bag stabilization, has been suggested in cases of more profound zonular weakness.^[9] Also, recently, combined pars plana phacofragmentation, vitrectomy, and Artisan lens implantation has been described for traumatic subluxated cataracts.

PAL was first described by Packard *et al.*^[10] and Kelman^[11] for managing an imminent dropped nucleus. As an emergency procedure, PAL appears to be a safe procedure with no serious intraoperative or postoperative complications and with good visual rehabilitation.^[2,4] Lifshitz *et al.*^[4] reported the long-term outcome of PAL in seven cases of a sinking dropped nucleus during phacoemulsification. In their report, postoperative visual acuity was 20/40 or better in all but two eyes. No postoperative retinal detachment, retinal tears or other complications were observed.^[4]

Chang *et al.*^[3] described a modified PAL technique using sodium hyaluronate 3.0%–chondroitin sulfate 4.0% (Viscoat[®]) in eight eyes and provided postoperative clinical data.

Table 1: Preoperative, intraoperative, and postoperative findings in four patients in whom the P-PAL technique was used

Parameter	Patient			
	1	2	3	4
Age (years)	64	72	85	60
Gender	M	M	F	F
Eye	LE	LE	LE	RE
Diagnosis	Subluxated lens	Subluxated lens, secondary glaucoma	Subluxated lens, secondary glaucoma (advanced)	Subluxated lens, secondary glaucoma
Etiology	Blunt trauma	Spontaneous	Spontaneous	Blunt trauma
Preoperative BCVA	20/200	LP	CF 1 m	20/60
Cataract type	ASCC, NS, PSCC	Mature	Mature	Brunescent
Zonular disorders	Phacodonesis	Phacodonesis, PXF	Phacodonesis, PXF	Phacodonesis
Vitreous in AC	-	+	+	+
Surgical technique	P-PAL	P-PAL + anterior vitrectomy + PI	P-PAL + anterior vitrectomy + PI	P-PAL + anterior vitrectomy + PI
IOL placement	AC	AC	AC	AC
Final BCVA	20/40	20/50	20/80	20/40
Follow-up (months)	24	12	1	26
Complications	None	POD 1: high IOP (transient)	Corneal erosion (transient)	POD 1: vitreous hemorrhage (transient)
Fundus examination	Intact	Intact	Cup/disk ratio = 0.6 Pall disk rim	Intact

M: Male, F: Female, LP: Light perception, CF: Count fingers, ASCC: Anterior subcapsular cataract, NS: Nuclear sclerosis, PSCC: Posterior subcapsular cataract, PXF: Pseudoexfoliation, AC: Anterior chamber, BCVA: Best corrected visual acuity, IOL: Intraocular lens, IOP: Intraocular pressure, LE: Left eye, PI: Peripheral iridectomy, POD 1: Postoperative day 1, RE: Right eye

Postoperative visual acuity was 20/40 or better in all but one eye. Recently, Por *et al.*^[12] described the use of PAL technique accomplished by the pars plana insertion of a needle, in 3 cases of dropped nucleus/nuclear fragments, 1 case of intraoperative subluxated posterior chamber intraocular lens (PC IOL), and 10 cases of late subluxated PC IOLs. One case of retinal detachment occurred 20 months after PAL. BCVA was 20/40 or better in all except three cases.

An important concern regarding PAL is the possibility of vitreous traction and retinal tears resulting in postoperative retinal detachments. Within the limitation of our case series, to date we have no cases of retinal holes, tears or detachment after planned PAL. Many surgeons, particularly in the West, may be no longer skilled in nuclear expression technique, although in our opinion every cataract surgeon may be familiarized with it because not every cataract case is suitable for phacoemulsification.

To our knowledge, we are the first to report P-PAL as a planned procedure for extracting severe subluxated cataracts. We successfully used P-PAL in four eyes with extreme zonular dialysis, marked phacodonesis with generalized weakness of zonules due to trauma or severe pseudoexfoliation.

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