

## Extended focal length intraocular lens implantation in posttraumatic posterior capsular rupture

*Preethi Srinivasaraghavan, Dhivya Ashok Kumar,  
Amar Agarwal, Akshya Parthasarathy*

We present a case of posterior capsular defect with traumatic cataract after blunt trauma in which an extended focal length intraocular lens (IOL) was implanted in the bag after conventional phacoemulsification and anterior vitrectomy. Anterior segment optical coherence tomography performed preoperatively aided in the confirmation and documentation of the capsular integrity. Intraoperative trocar anterior chamber (AC) maintainer allowed AC maintenance without further complications. IOL was well centered postoperatively at 6 months, and the unaided visual acuity was 20/20 for distance and N8 for near. The report showed that an extended depth of focus IOL can be placed in eyes with ruptured posterior capsule for good visual outcome in posttraumatic young eyes and it may not be considered as a relative contraindication for it.

**Key words:** Extended depth of focus, extended focal length intraocular lens, posterior capsule rupture, traumatic posterior capsule tear

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Dr. Agarwal's Eye Hospital and Eye Research Centre, Chennai, Tamil Nadu, India

**Correspondence to:** Dr. Dhivya Ashok Kumar, Dr. Agarwal's Eye Hospital and Eye Research Centre, 19, Cathedral Road, Chennai - 600 086, Tamil Nadu, India. E-mail: [susruta2002@gmail.com](mailto:susruta2002@gmail.com)

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Blunt ocular trauma is often associated with variable damage either to the cornea, lens, or retina.<sup>[1]</sup> Posterior capsular (PC) tear following blunt trauma and their management has been reviewed in literature.<sup>[1-9]</sup> However, reports related to the implantation of an extended focal length intraocular lens (IOL) in an eye with traumatic posterior capsule rupture (PCR) is scarce.<sup>[1-9]</sup> Here, we present a case of an isolated PCR after blunt trauma with rapid cataract formation which was meticulously managed with cataract extraction and extended focal length IOL placement in the bag, with very good postoperative visual outcome.

### Case Report

A 26-year-old man presented with complaints of blurred vision in his right eye of 1-week duration following blunt ocular trauma. He gave a history of injury sustained to the right side of the face near the cheek and right forehead 10 days before presentation. He was a pillion rider in the motorcycle and due to sudden break application; his face collided with a protruding log loaded in the vehicle which was moving in front of his motorbike. He had two lacerations one near the corner of right eyebrow near the forehead, and one on the skin over the right zygomatic region and they were sutured as first aid measure in local hospital after ruling out other faciomaxillary injuries by specialists there. He gave a history of swelling and inability to open his right eyelid for initial 3 days following injury and history of noticing defective vision in RE on the 4<sup>th</sup> day on opening the eyelid once the swelling subsided.

On examination, the uncorrected visual acuity (UCVA) in his right eye was 20/120 improving to 20/60 with +2DS/-2DC at 40° correction. K reading as measured by autokeratometer and refractometer did not show significant corneal astigmatism.

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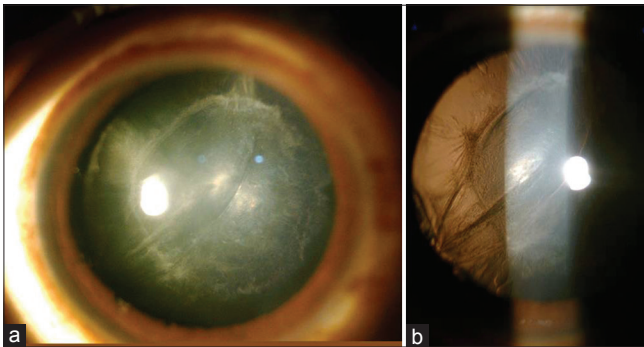
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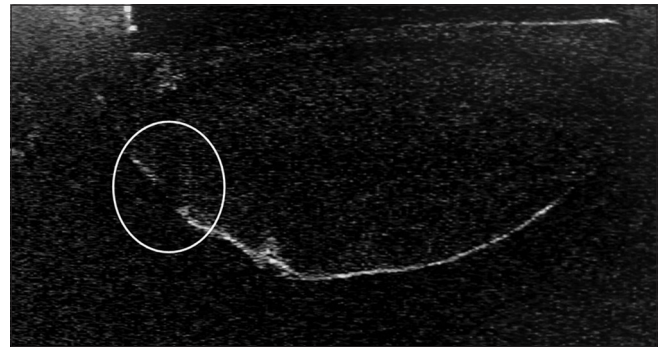
The intraocular pressure in the right eye was 14 mmhg. Cornea showed few pigment deposits on the endothelium, and the rest of the layers were within normal limits. Anterior chamber (AC) was deep and showed cellular reaction of 1+ grade with few pigment dispersions. Lens showed a dense posterior subcapsular cataract [Fig. 1] with an oval defect in the posterior capsule which was confirmed with the help of an anterior segment optical coherence tomography (Visante, Carl Zeiss) [Fig. 2]. Gonioscopy and detailed peripheral retinal examination with scleral indentation were done as it was a case of trauma and were within normal limits. Examination of the left eye was within normal limits, and the unaided visual acuity was 20/20.

The occupation of the patient, visual expectations, and motivation to remain spectacle free in the future were discussed and considered and after all the risks duly explained to him, the patient was taken up for cataract removal with extended focal length IOL implantation [Video Clip 1] after control of inflammation and after waiting for a period of 4 weeks from the time of injury for better fibrosis of PCR edges so that fear of extension of PCR is lesser and In the bag IOL placement can be achieved after a good biometry. Axial length was measured by immersion biometry (24.07 mm) and optical biometry, and K reading was obtained from optical biometer (K1 41.77D/8.08 mm at 55°, K2 42.03D/8.03 mm at 145°, ACD 4.33 mm) and manual keratometer. IOL power calculation was done using SRK T formula, and the appropriate IOL power (SYMFONY +22.0 D) was selected for implantation. A superotemporal triplanar clear corneal incision measuring 2.8 mm was made using a keratome. The side port was made 2

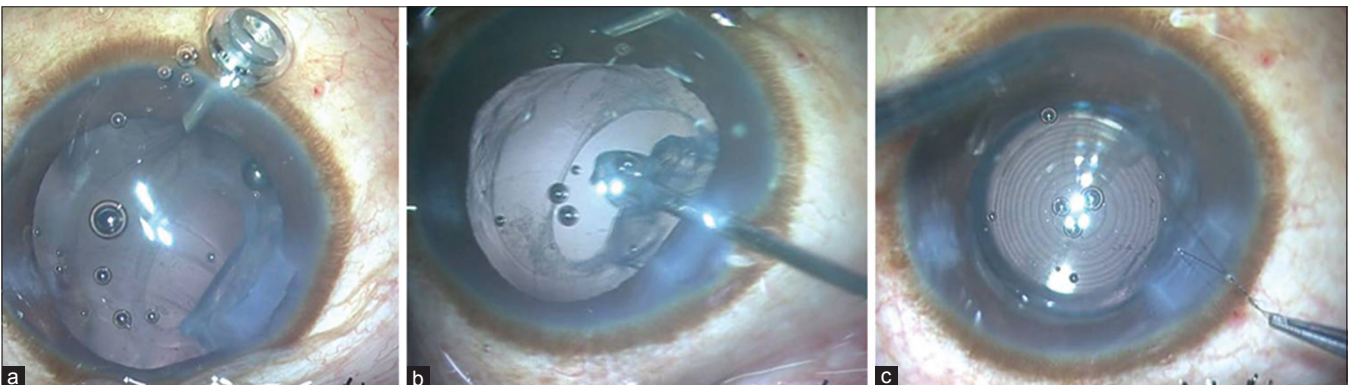
clock hours anticlockwise from the main port, and the AC was entered. The anterior capsule was stained using trypan blue and a 5.5 mm continuous curvilinear capsulorhexis was made using a cystotome. The lens material was removed using high vacuum low flow rate when preexisting PC rupture was clearly viewed, viscoelastic, 2% hydroxypropyl methylcellulose was injected through the side port, and the irrigation-aspiration probe was removed from main port. A trocar AC maintainer was fixed in the AC. Trocar AC maintainer was not placed in the beginning on purpose as it could interfere with rhexis and if turned on, saline flow through it into AC could increase the hydrostatic pressure in AC which could cause further damage to the weak posterior capsule. It was placed as a measure to maintain AC when anterior vitrectomy was commenced. At 0.5 mm from the limbus, an obliquely angled sclerotomy incision was framed; after conjunctival displacement, the trocar was introduced at a 45° angle to the sclera, parallel to the limbus. The trocar was then turned 90° perpendicular to the limbus and directed toward the AC, so the trocar enters the AC in front of the iris tissue. The cannula was flushed to the surface of the sclera, and the trocar was withdrawn, leaving the cannula in place. The infusion line was then attached to the hub of the cannula, and the infusion turned on. The remaining cortex and lens material were removed after anterior vitrectomy using a vitrectomy cutter [Fig. 3].<sup>[10]</sup> As the vitreous disturbance was minimal and the operating surgeon was sure of no residual vitreous in AC after vitrectomy by observing a round pupil and air bubble test in AC, intracameral triamcinolone injection was not done at the end of anterior vitrectomy.



**Figure 1:** Diffuse (a) and slit image (b) showing the posterior capsule defect after blunt trauma with posterior subcapsular cataract



**Figure 2:** Anterior segment optical coherence tomography showing the defect in posterior capsule (circle)



**Figure 3:** Trocar anterior chamber maintainer fixed (a) and cortex removed (b) followed by extended depth of focus intraocular lens implantation (c)

A single piece extended focal length IOL (Symfony IOL, AMO) was implanted in the bag and centered. Care was taken to place the haptic perpendicular to the PCR. After the removal of the AC maintainer, the main wound and the side port were closed with a single 10-0 nylon suture. The eye had minimal AC reaction and well-secured wound on postoperative day 1 and day 3, the sutures at the main and side port were removed under sterile aseptic precautions. On postoperative day 7, UCVA was 20/20, with near visual acuity of N8 and a well-centered IOL was *in situ*. The patient remained comfortable throughout the postoperative period. At 6 months of follow-up, the patient visual axis clarity was maintained, no IOL deposits were present which would hamper vision, no evidence of posterior synechiae formation was observed. On follow-up at 12 months, the patient was comfortable with all daily activities including driving with no significant glare or haloes, with normal binocular single vision, the unaided visual acuity was 20/20, and N8 [Fig. 4] and no IOL decentration [Fig. 5] or pseudophakodonesis.

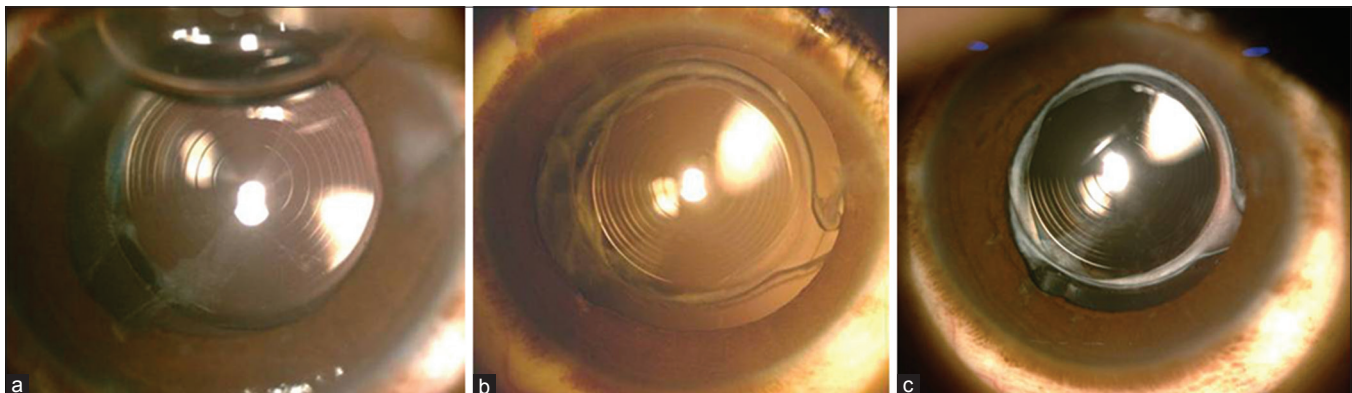
## Discussion

Wolter and Weidental have described mechanisms such as traumatic coup, contrecoup, equatorial expansion of the globe, and penetrating trauma as causes for lens damage following trauma.<sup>[9,11]</sup> Compression injury often leads to the equatorial elongation and stretching of zonules, which in turn causes thinning or stretching of posterior capsule for subsequent rupture. Coup injury occurs with the direct contusion from rapid focal indentation of the cornea onto the lens leading to lens damage. Contrecoup injury occurs with rapid anteriorly directed rebound vitreous which causes the posterior capsule to burst open. Wieger's ligament acts like a "battering ram," causing the contrecoup forces to press on the posterior capsule so that the rapid compression and expansion forces directed along the anteroposterior axis of the eye may avulse the central region of the posterior lens capsule.<sup>[12,13]</sup> In a forehead trauma damage to eye can occur in two scenarios; scenario 1 – if eye is protruded beyond the frontal line and scenario 2 – in deep-set eyes if the eyeball length is more as in highly myopic eyes, it can renders the cornea to the level of the forehead-cheek line, in both cases, the object or injury forces causing injury to the forehead, can cause trauma to the cornea.

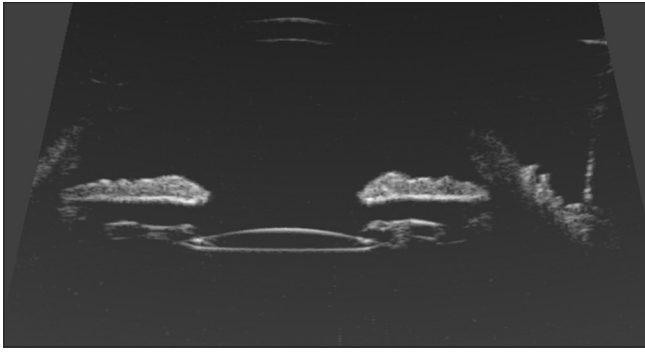
The idea to implant multifocal IOLs in eyes with traumatic cataract is from the necessity to restore simultaneously both

the near and distance vision as well as attempting to maintain binocular vision, especially for the young. Those patients with good corneal integrity and a good potential acuity, the multifocal IOL implantation, even in a defective capsule can be considered after explaining the potential risk and benefits to the patient and the refractive goal is usually to achieve emmetropia or slight myopia, and the use of partial coherence interferometry as in newer generation optical biometry can be helpful for enhancing the accuracy of IOL power selection and achieving that refractive target in addition to immersion biometry. The measurements from immersion biometry are proven to be accurate even in dense cataract and should also be compared wherever possible to verify the accuracy of the calculation.

Extended focal length IOL is an option for young patients with traumatic cataract, provided they are motivated enough to remain spectacle free with all the risks explained. The objective of extended focal length or multifocal IOL implantation is to avoid spectacle use for distance- and near-vision tasks. However, this requires good preoperative assessment including accurate biometry, and intraoperative assessment of IOL centration and stability, control of astigmatism and long-term IOL stability to achieve the desired outcome. Very few reports of multifocal lens implantation in traumatic cataract have been described in literature. Jacobi *et al.* compared zonal progressive multifocal lens with monofocal lenses in cases of trauma.<sup>[14]</sup> Those with multifocal had better stereopsis and lesser dependency on glasses for near vision. In a case report by Zeng *et al.*, a child suffering from traumatic cataract with corneal astigmatism of 2.14 D was corrected by phacoemulsification and toric multifocal IOL implantation.<sup>[15]</sup> In younger patients, multifocal design of the IOL optic allows an efficient treatment for amblyopia. Thus, multifocal IOL has been recommended in the management of traumatic cataract in children. The extended depth of focus lens placement in PCR depends on the location, extent and stability of PCR and can be achieved only by strong margins of PCR. We have not used triamcinolone to stain the vitreous in this case; however, Intraoperative viscoelastic was used to protect anterior hyaloid face and decrease vitreous loss. Trocar AC maintainer has been used for chamber maintenance. Anterior vitrectomy has been performed using the vitreous cutter, and the completeness of vitrectomy was confirmed by normal pupil configuration and the air bubble test by the end of the procedure.



**Figure 4:** Postoperative slit lamp picture on day 1 (a), 1 month (b), and 12 months (c)



**Figure 5:** Postoperative ultrasound biomicroscopy at 12-month postsurgery showing no tilt and good centration and stability of intraocular lens

## Conclusion

Isolated PC rupture following blunt trauma with traumatic cataract with no other additional ocular damage in young patient is itself a rare entity. More patient recruit, long-term follow-up and qualitative assessment with patient satisfaction score are being aimed at in future to further add value to this report.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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