

Clinical outcomes in traumatic pseudophacocele: A rare clinical entity

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Purpose: The purpose of this study is to evaluate the clinical outcomes in patients with traumatic pseudophacocele. **Methods:** In this retrospective, interventional case series, scleral wound repair with pars plana vitrectomy and glued intrascleral fixation of an intraocular lens (glued IOL) was performed in 5 eyes of 5 patients. Pupilloplasty was performed in 3 cases whereas aniridia glued IOL fixation was done in 1 case that had total avulsion and loss of iris tissue. The main outcome measures were best-corrected visual acuity (BCVA), intraoperative and postoperative complications during the entire follow-up period. **Results:** The preoperative vision ranged from hand movement to perception of light in all the patients. The mean postoperative BCVA was 0.42 ± 0.21 Snellen's decimal equivalent (SDE) at final follow-up. Postoperatively, all the cases retained good visual acuity with case 1 and case 2 reporting 0.5 SDE, case 3 had 0.33 SDE, case 5 had 0.67 SDE whereas case 4 had a final visual acuity limited to 0.1 SDE due to associated corneal opacity. The mean follow-up period was 20.2 ± 11.7 months (range from 9 months to 36 months). The IOL was well centered, all the wounds were well apposed and the mean postoperative intraocular pressure was 14.6 ± 1.95 mm Hg. No complications were reported in the entire follow-up period. **Conclusion:** The clinical outcomes of management of pseudophacocele were encouraging with retention of reasonably good visual potential in all cases.

Key words: Blunt trauma, glued intraocular lens, hyphema, intraocular lens dislocation, pars plana vitrectomy, pseudophacocele, pupilloplasty, single pass 4-throw technique, trauma, vitreous hemorrhage

Ocular trauma leads to significant ocular morbidity and is often associated with the luxation of crystalline lens in a phakic eye and of the intraocular lens (IOL) in a pseudophakic eye. Biedner *et al.*^[1] first reported the subconjunctival extrusion of an IOL associated with globe rupture following blunt ocular trauma and consequently the terminology of "pseudophacocele" was formulated. Subsequently, many authors have reported pseudophacocele following trauma^[2-4] and in extreme cases, the posterior chamber (PC) IOL has been reported to be completely extruded from the eye.^[5-8]

Pseudophacocele is an emergency situation with endophthalmitis development as a major risk factor. Data on visual outcomes in patients with pseudophacocele are limited due to the rarity of the clinical condition. All the studies in peer literature have reported a single case report till date.^[1-6] In the current study, the outcomes and management of 5 cases of pseudophacocele secondary to ocular blunt trauma were retrospectively analyzed and the results formulated.

Methods

The study adhered to the Declaration of Helsinki and the authors obtained prior approval of the study protocol by the Local Ethical Committee. The clinical records of all the 5 cases that presented to us were included in the study and were reviewed and their demographic features, preoperative findings, intraoperative findings, and postoperative outcomes were determined. Informed consent with explained visual

prognosis was taken from all the patients and their immediate relatives. None of the cases were excluded from the study.

Preoperatively, all the cases were examined in detail with the aspect of external and internal ocular findings, and visual acuity was recorded. Postoperatively, Snellen's decimal equivalent (SDE) was employed for analyses and documentation of visual status.

Slit lamp examination, a B-scan ultrasound, and an anterior segment optical coherence tomography (AS-OCT; Carl Zeiss Meditec, Inc.) examination was done in all the cases to detect the extent and the site of rupture and also to evaluate the intraocular structure details. B-scan examination was performed very carefully taking care not to exert too much pressure on the open globe. Although preoperative intraocular examination details are difficult to evaluate with an OCT, the location of an IOL in subconjunctival space and the postoperative apposition of the scleral rupture wound was confirmed and assessed with an AS-OCT. The quadrant of scleral rupture was noted and the exact extent of scleral rupture was evaluated intraoperatively.

Preoperative intraocular pressure (IOP) was very low due to rupture of the globe whereas the postoperative IOP was recorded in all the cases at varied periods of follow-up. All the cases were operated within the first 24 h of presentation following trauma. Under general anesthesia, all the cases

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underwent scleral wound repair and pars plana vitrectomy with glued intrascleral fixation of IOL (glued IOL)^[9-11] was performed for all the cases in the same setting. Aniridia glued IOL^[12] was performed for case 1 and additional pupilloplasty procedure^[13,14] was performed for cases 2, 3, and 4.

Postoperatively, the patients were followed up at day 1, day 7, 1 month, and thereafter every 2 months for the next 1-year. Later, the patients were asked to follow-up every 6 months for a routine check-up.

Surgical Technique

In pseudophacole, as the ruptured scleral wound was covered with conjunctiva, the contour and the integrity of the eye were maintained to some extent [Fig. 1a]. An anterior chamber maintainer [ACM; Fig. 1b] or a trocar-ACM^[15] was initially introduced for fluid infusion [Fig. 2]. An ACM or a trocar-ACM was placed in position for fluid infusion as against a pars plana site to avoid starting an infusion blindly inside the eye as the tip of the fluid infusion at the pars plana site cannot be clearly assessed due to the presence of associated vitreous hemorrhage that precludes its visualization.

Introduction of fluid inside the eye in the initial stages of the surgery helps to maintain the globe inflation and prevents it from collapsing. The conjunctival dissection was done and the scleral wound was explored. The dislocated IOL was detected and was carefully removed from the subconjunctival space [Fig. 1c]. The scleral wound was sutured with a 10-0 nylon suture and the subsequent passage of a muscle hook in the rectus muscle in the area of the quadrants involved helped to rotate the globe and assess its integrity. As in a glued IOL procedure, two partial thickness scleral flaps were made 180

degrees opposite to each other. With the vitrectomy probe introduced from the limbal paracentesis incision, a limited anterior vitrectomy was performed to clear the blood and vitreous lying in the anterior chamber [AC; Fig. 1d]. Standard two-port pars plana incisions were framed, and 23 G trocars were introduced. Endoillumination was introduced through one port and a 23 G vitrectomy cutter was introduced through the other port.

Vitrectomy (Alcon; Constellation) was performed, and the vitreous hemorrhage was cleared with careful inspection of retina and its periphery. Few scleral sutures were opened up to introduce a 3-piece IOL and glued IOL fixation was done for the cases [Fig. 1e; Video 1]. The gap created in the scleral wound for IOL introduction was again sutured, and the globe integrity was restored.

As one case had total aniridia due to iris avulsion, an aniridia IOL was fixed for the case with glued IOL technique. Pupilloplasty was performed in 3 cases that had traumatic iris distortion to reshape and restructure the pupil [Fig. 1f]. The trocar-anterior chamber maintainer was removed, fibrin glue was applied beneath the scleral flaps and all the conjunctival wounds were sealed.

All the patients received standard postoperative therapy of topical dexamethasone 0.1% and antibiotics 4 times daily combined with a cycloplegic agent for the initial 1st week. The medications were subsequently tapered over a period of 1 month. If a patient experienced steroid-responsive

IOP elevation, the standard steroid strength, dosing frequency, or both were reduced as necessary to manage the pressure and instillation of nonsteroidal anti-inflammatory drug was considered.

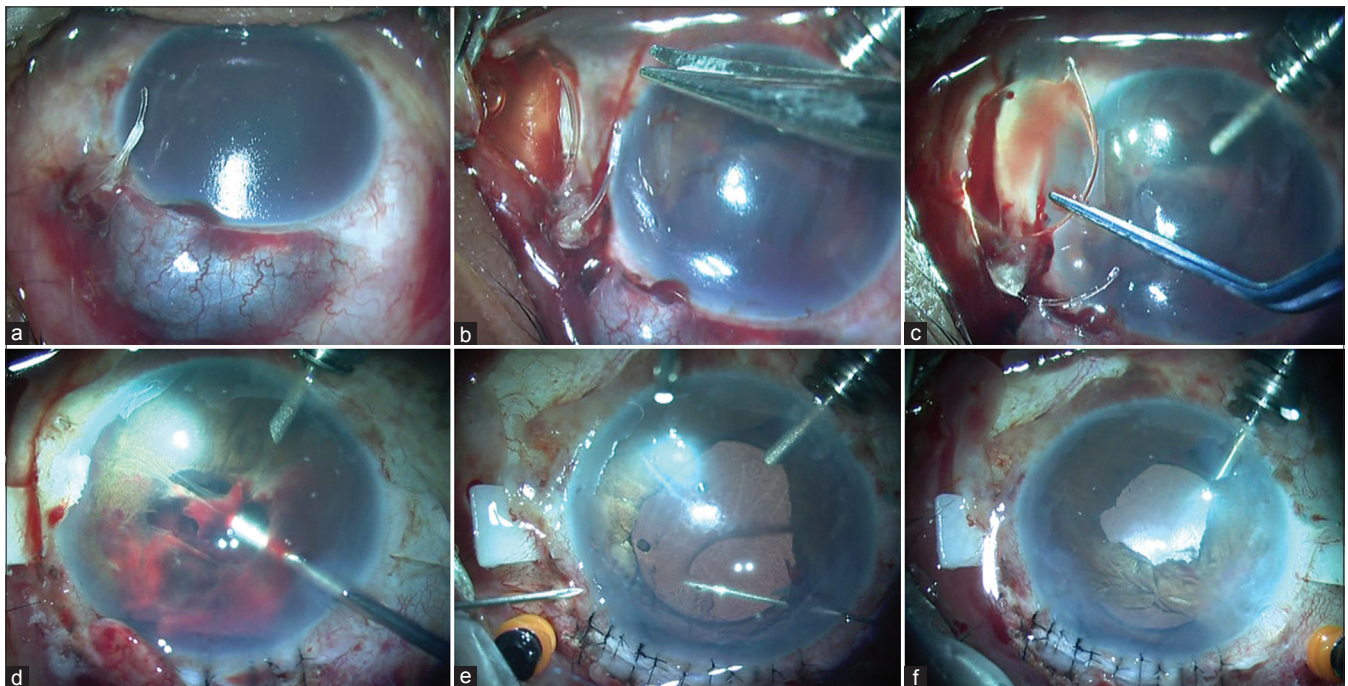


Figure 1: (a-f) Pseudophacole in case 3. Protruding haptic of an intraocular lens seen. An anterior-chamber-maintainer placed. The intraocular lens and broken haptic removed. The scleral wound is sutured, anterior vitrectomy done, flaps made for glued intraocular lens. A 3-piece intraocular lens is fixated and pars plana vitrectomy is performed followed by pupilloplasty. Pupil reconstruction

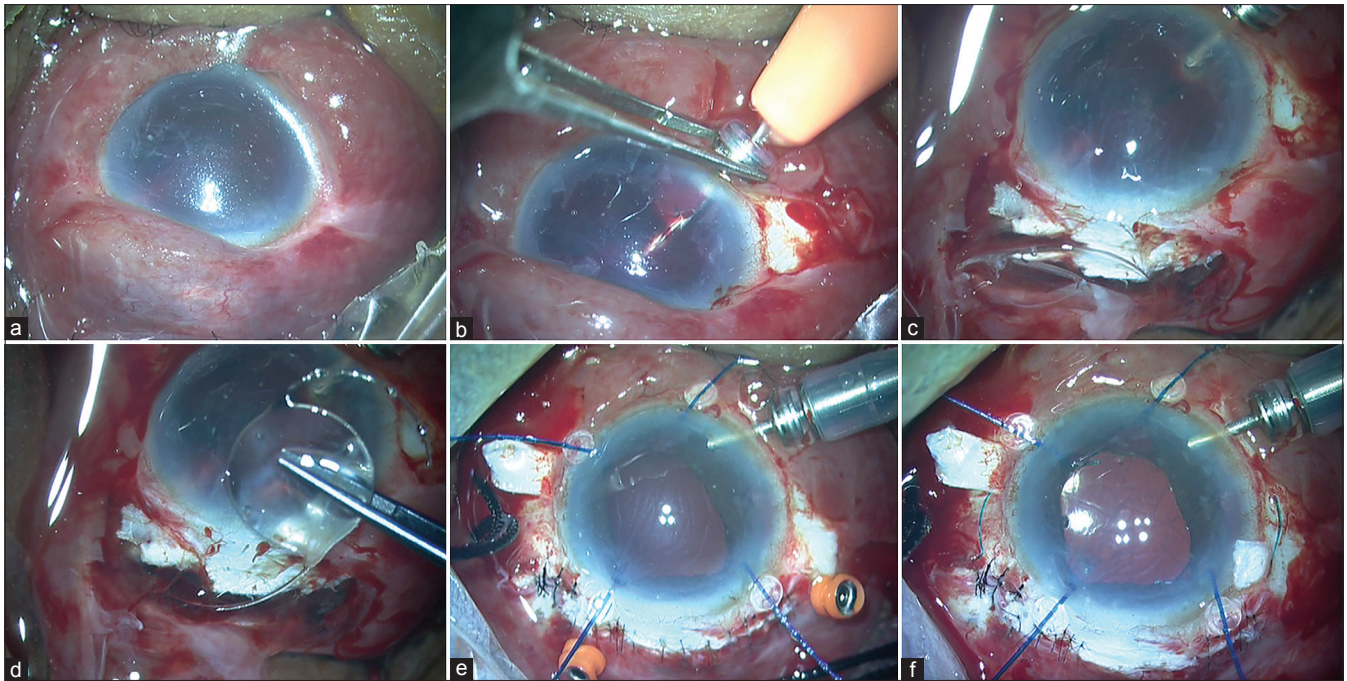


Figure 2: (a-f) Management of pseudophacocele in Case 5. Conjunctival chemosis is seen. A trocar-anterior chamber maintainer placed for fluid infusion. Conjunctival tear with scleral rupture and a nonfoldable 1-piece intraocular lens is detected. The intraocular lens is removed. Scleral wound repair and posterior vitrectomy done. Scleral flaps made for glued intraocular lens. Glued intraocular lens fixation done

Results

This retrospective, interventional series involved 5 eyes of 5 patients. The median age of 2 men and 3 women were 61 years (range from 54 to 69 years). All the IOLs that were extruded in the subconjunctival space were PC IOLs. These IOLs were removed and were replaced by the IOLs that were fixated by calculating the IOL power of the fellow eye, as the previous records of the eye with pseudophacocele were not available.

Pars plana vitrectomy with glued intrascleral haptic fixation of an IOL (glued IOL) was performed for all the cases as a single stage procedure. An aniridia glued IOL was fixated in 1 eye (case 1) that had total avulsion and loss of iris tissue whereas pupilloplasty procedure was performed in 3 cases (cases 2, 3, and 4). The preoperative visual acuity in all the cases ranged from hand movements to perception of light. The presence of hyphema and vitreous hemorrhage precluded the posterior view of the fundus and other intraocular details. B-scan ultrasound examination demonstrated vitreous opacity suggestive of vitreous hemorrhage with no retinal or choroidal detachment [Fig. 3a]. A preoperative AS-OCT examination clearly delineated the scleral discontinuity and the presence of an IOL in the subconjunctival space [Fig. 3c]. The superotemporal quadrant was involved in 3 cases, superonasal in 1 case and the superior quadrant in 1 case.

Exploration of the wound was done under general anesthesia and surgical repair of the scleral wound was performed in all the cases. All the patients underwent a pars plana vitrectomy with secondary IOL fixation with glued IOL technique as a single stage procedure. Case 1 had complete aniridia, hence, aniridia IOL was fixated for this case with the Glued IOL technique [Fig. 4].

Modified Siepser's knot pupilloplasty technique was employed in case 3 whereas single pass 4-throw technique was performed in case 2 and case 4.

Table 1 demonstrates the demographic details and clinical features of all the cases. The mean postoperative best-corrected visual acuity (BCVA) was 0.42 ± 0.21 SDE at the last follow-up.

Postoperatively, all the cases retained good visual acuity with case 1 and case 2 reporting a 0.5 SDE, case 3 had 0.33 SDE vision, case 5 had 0.67 SDE whereas case 4 had a final visual acuity limited to 0.1 SDE due to associated corneal opacity. The mean follow-up period was 20.2 ± 11.7 months (range from 9 months to 36 months) and all the patients retained their BCVA till the last follow-up.

In the entire postoperative period, the IOL was well centered, all the wounds were well apposed and the mean postoperative IOP at 1 month follow-up was 14.6 ± 1.95 mm Hg (range from 12 to 17 mm Hg). Postoperative B-scan [Fig. 3b] and AS-OCT [Fig. 3d] helped assess the posterior segment and wound architecture, which showed good apposition [Fig. 3b]. None of the cases had postoperative ocular hypotony or developed secondary glaucoma or had any posterior segment pathologies such as retinal detachment (RD), choroidal rupture or a cystoid macular edema during the entire follow-up period.

Discussion

Subconjunctival dislocation of an IOL is threatening sequelae to blunt ocular trauma in pseudophakic eyes. The concussion force tears the zonules and the scleral wall allowing extrusion of the IOL and the intraocular structures. The cause of trauma in 3 cases was a direct blow to the globe whereas in 2 cases it was due to a fall. A PC IOL was present in all the cases that presented to us with pseudophacocele. Studies have demonstrated PC

IOLs are more resistant to ocular trauma as compared to AC IOLs and iris fixated IOLs.^[16] PC IOLs easily bear the brunt of mild to moderate trauma but in the current study we feel the cases probably had suffered severe blunt trauma that led to IOL dislocation into the subconjunctival space. However, disastrous associated features such as RD or choroidal involvement were not seen in any of the case probably due to cover up of the scleral wound by an intact conjunctiva that retained the

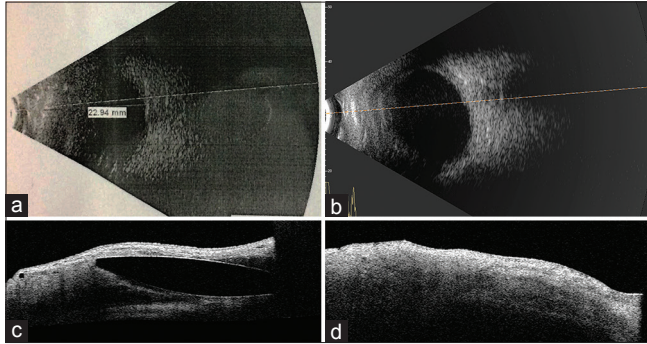


Figure 3: (a-d) B-scan ultrasound and anterior segment optical coherence tomography images. Preoperative B-scan image depicting vitreous opacity suggestive of vitreous hemorrhage with intact retina. Postoperative B-scan shows a clear and a normal posterior segment. Preoperative anterior segment optical coherence tomography depicting the subconjunctival extrusion of an intraocular lens. Postoperative anterior segment optical coherence tomography depicting a normal subconjunctival space with apposed wound

IOL in the subconjunctival space. This prevented the globe from collapsing totally thereby averting the major posterior segment complications that could arise due to sudden massive decompression of the eye. Second, we also believe that due to the cover-up of scleral wound by conjunctiva, the intraocular structures were prevented from being directly exposed to the environment thereby curtailing the chances of development of endophthalmitis. Nevertheless, it is essential to state that the treatment of pseudophacocele is an emergency and the globe integrity should be restored at its earliest. In all our cases, the treatment was ensued within 24 h of traumatic insult to the eye.

Following a blunt ocular trauma, scleral rupture is most commonly observed at superonasal and temporal quadrants. Moreover, the presence of supraorbital rim and nasal bridge

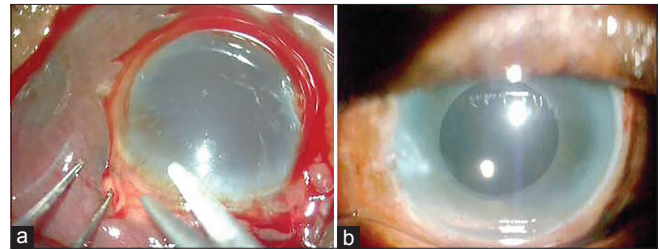


Figure 4: (a and b) Preoperative and postoperative image of Case 1. Preoperative image depicting pseudophacocele with total loss of iris tissue. Postoperative image of aniridia with glued intraocular lens fixation with pars plana vitrectomy and scleral wound repair.

Table 1: Demographic, intra- and postoperative details

	Case 1	Case 2	Case 3	Case 4	Case 5
Eye: RE/LE	RE	LE	RE	LE	LE
Sex (male/female)	Male	Female	Male	Female	Female
Cause of trauma	Direct blow	Fall	Bull horn blow	Fall	Blow
Preoperative vision	PL+ PR+	HM+	PL+ PR+	PL+ PR+	PL+PR+
Surgery	SICS 3-piece nonfoldable IOL	SICS Single piece nonfoldable IOL	ECCE Single piece nonfoldable IOL	SICS 3-piece foldable IOL	ECCE Single piece nonfoldable IOL
Postoperative BCVA (SDE)	0.5	0.5	0.33	0.1	0.67
Duration between previous surgery and trauma (years)	5	1	8	4	14
Quadrant of rupture	Superior	Superonasal	Superotemporal	Superotemporal	Superotemporal
Degree of scleral tear	70	90	120	70	120
Associated complications	Vitreous hemorrhage + hyphema + aniridia	Vitreous hemorrhage + iris prolapse	Vitreous hemorrhage + hyphema + iris prolapse	Corneal injury + hyphema + vitreous hemorrhage + iris prolapse	Vitreous hemorrhage + iris prolapse
Type of surgical intervention	Posterior vitrectomy + aniridic glued IOL	Posterior vitrectomy + glued IOL + pupilloplasty	Posterior vitrectomy + glued IOL + partial iris excision + pupilloplasty	Posterior vitrectomy + glued IOL + iris excision + pupilloplasty	Posterior vitrectomy + glued IOL
Last postoperative follow-up (months)	36	15	29	12	9
Postoperative IOP (mmHg) at 1 month	14	12	17	16	14

RE: Right eye, LE: Left eye, HM: Hand movement, PL: Perception of light, PR: Projection of ray, SICS: Small incision cataract surgery, ECCE: Extra capsular cataract extraction, IOP: Intraocular pressure, mmHg: Pressure, SDE: Snellen's decimal equivalent, BCVA: Best-corrected visual acuity, +: Present, HM+: Hand movement present, PL +: Perception of light present

makes the temporal and inferior quadrant more susceptible to trauma.^[17-19] In the current study, the superotemporal quadrant was involved in 3 cases whereas the superior quadrant and the superonasal quadrant were involved in 1 case each. In pseudophakic eyes, following a blunt trauma, the globe ruptures at its weakest point, i.e., the surgical wound from previous cataract surgery. In all our cases, the previous surgical wound opened up even though the cataract surgery was performed many years before the blunt trauma (range 1–14 years) occurred. This can be attributed to either poor wound construction or inherent weakness in the area of incision. As in other studies, late rupture of surgical wound indicates that the surgical incision site is the area of least resistance, even after many years of postoperative period.^[7] Incidentally, in our series, we did not come across a ruptured wound following phacoemulsification and this we attribute to the fact that it may be due to better wound integrity that prevents the sudden collapse of the globe and its sequelae. However, it has been reported that patients can suffer wound dehiscence even after 20 years of the cataract surgery suggesting there is no time limit for the surgical wounds to gape following excessive trauma.^[20]

The visual outcomes depend on many factors such as the amount of vitreous loss, condition of the iris and uveal tissue, RD, and associated intraocular damage.^[20-22] In the current study, there was no significant posterior segment involvement except vitreous hemorrhage that was handled with pars plana vitrectomy. There was marked improvement in the visual outcomes in all the cases with no significant postoperative complication.

Previous studies have reported management of pseudophacocele with or without pars plana vitrectomy.^[1-6] The eyes were either rendered aphakic^[1-3] or an IOL was placed in the ciliary sulcus in isolated cases.^[4] Our management protocol highlights performing a pars plana vitrectomy with glued IOL and pupilloplasty if needed to optimize the visual outcomes in eyes that had total expulsion of the capsular bag along with the IOL. Glued IOL allowed stable fixation of an IOL and pupilloplasty helped to maintain the sanctity of the pupil architecture thereby preventing photophobia and glare. Although the combined procedure of PPV and Glued IOL can also be performed as a two-stage procedure with the secondary IOL fixation being performed at a later stage, the single stage procedure prevented the eye from being exposed to a second surgical procedure at a later period and also allowed early visual rehabilitation to the patients.

In summary, the visual and clinical outcomes in all our cases were satisfactory and taking into consideration the rarity of the clinical condition of pseudophacocele, the authors believe that this study that has a varied follow-up period adds a definite value to the current scenario of effective management of pseudophacocele and simultaneously also serves as the largest compilation of pseudophacocele cases in the peer reviewed literature.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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