Removal of Dislocated Intravitreal Lens Nucleus and Lens Fragments

APICHART SINGALAVANIJA, M.D.*,
PARAPAN BAMROONGSUK, M.D.*

Abstract

Forty-four eyes of 43 patients with retained intravitreal entire lens, lens nucleus and lens fragments were analysed. The causes of lens dislocation were post couching, following phacoemulsification, trauma and Mafan's syndrome. Sixteen eyes (36%) with small lens fragments required only pars plana vitrectomy for surgical removal. The entire lens, lens nucleus or large lens fragments in 28 eyes (64%) were removed by a standard three-port pars plana vitrectomy, lifting the lens into the anterior chamber by vitrectomy probe under high vacuum suction and then delivered through a limbal incision. All cases were successfully removed and most of the visual outcome was better than the preoperative check up. The technique of lifting the lens into the anterior chamber is simple and safe.

Posterior dislocation of the lens is found in trauma, hereditary systemic diseases, post cataract extraction and post couching. Nowadays, the accidental dislocation of lens nucleus and lens fragments during phacoemulsification seems to be the most common cause.

The removal of hard lens nucleus and large lens fragments can be managed by various methods such as performing pars plana vitrectomy and crushing the lens into small pieces,[1,2] using foreign-body forceps and vitrectomy,[3] using intravitreal phacofragmentaion[4-8] and elevating the lens by injecting high density vitreous substitute[9,10]. These techniques sometimes have serious intraoperative and postoperative complications like retinal tears and retinal detachments[1-3,11].

We studied the efficacy of surgical removal of intravitreal lens nucleus and lens fragments by simple pars plana vitrectomy without the use of any vitreous substitute or phacofrag-

* Department of Ophthalmology, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.

† This work was presented in part at the 16th Congress of Asia Pacific Academy of Ophthalmology, held in Kathmandu, Nepal 2-6, 1997.

mentation. Preoperative assessments, postoperative complications and final visual acuity outcomes were analysed in this study.

MATERIAL AND METHOD

A total of 44 eyes of 43 patients with retained intravitreal entire lens, lens nucleus or lens fragments who were admitted to the Department of Ophthalmology, Siriraj Hospital, Mahidol University, Bangkok, between January 1990 and August 1997 were analysed. Twenty-four cases were male and nineteen cases were female. Age ranged between 12 to 76 years with a mean of 56.5 years.

The detailed history of all the patients was recorded, and complete systemic and eye examination were carried out. The eye examination included the visual acuity, intraocular pressure, biomicroscopy for cells in the anterior chamber and vitreous, and fundus examinations. The exact cause of lens dislocation and the duration of the retained lens material was determined and recorded. Topical steroid eye drops were given to patients having intraocular inflammation. In patients with increased intraocular pressure (25 mmHg or higher) the intraocular pressure was controlled preoperatively by timolol eye drop and oral acetazolamide.

Sixteen cases with small lens fragments were removed by a standard pars plana vitrectomy, hard lens nucleus and large lens fragments (more than 50% of nucleus) in 27 cases (28 eyes) were removed through a limbal incision (Table 1).

Hard lens nucleus removal was performed by a three-port pars plana vitrectomy. All the vitreous adhesions around the lens were excised, the vitreous was removed as much as possible to prevent a subsequent traction. When the lens was freely movable and ready to be removed, a corneal paracentesis was made. Then a viscoelastic agent was injected into the anterior chamber to coat the endothelium of the cornea. The lens nucleus was lifted into the anterior chamber by using the vitrectomy probe. The vacuum pressure was set at 300 mmHg for the aspiration mode. The

Table 1. Surgical techniques of lens removal.

Operation	No. of eyes.	%
Pars plana vitrectomy	16	36
Pars plana vitrectomy + lens removal through a limbal incision	28	64

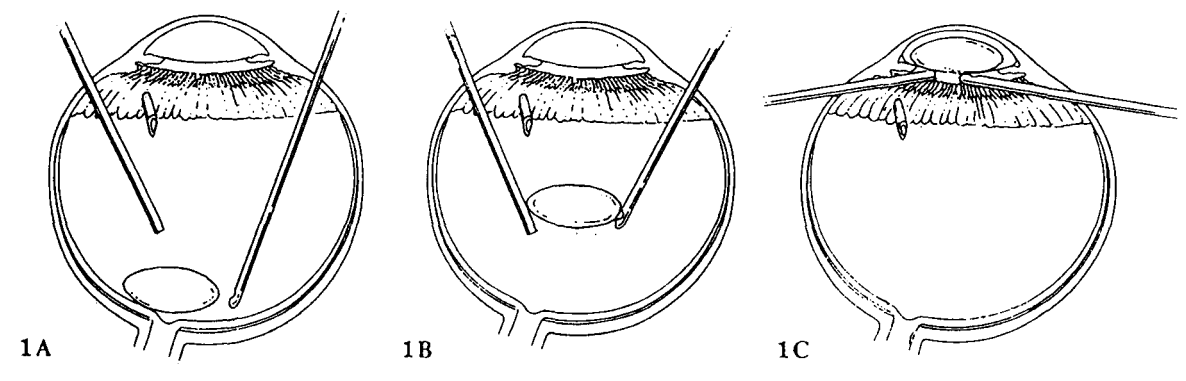

Fig. 1. Schematic diagram of removal of dislocated hard lens.
A. A vitrectomy probe engaged near the equator of the lens.
B. The lens was pulled by vitrectomy probe in aspiration mode (pressure about 300 mm Hg) and supported by a light probe.
C. The lens was pushed foreward through the pupil into anterior chamber.

probe was engaged at the equator of the lens, this vacuum pressure was high enough to catch and pull the hard lens nucleus. The light probe was used to support the back of the lens and to push it forward passing the pupil into the anterior chamber (Fig. 1A, 1B, 1C). The corneal incision was made wide enough to remove the lens through the cornea. The wound was closed with nylon 10-0. The retina was checked for any retinal tear or retinal hemorrhage by indirect ophthalmoscopy. Postoperative complications were recorded and the patients followed-up from 3-24 months.

RESULTS

The cause of lens dislocation in 43 patients (44 eyes) were post couching, following phacoemulsification, trauma and Marfan's syndrome. (Table 2). One patient with Marfan's syndrome had bilateral lens dislocation. The duration of retained intravitreal lens materials ranged from one week to 10 years. The dislocated lens nucleus with intact lens capsule remained inside the eye from one to 10 years in 19 eyes (Table 3). Lens fragments following phacoemulsification produced early ocular inflammation, all of the fragments were removed from one week to 6 months after dislocation. Preoperative complications of retained intravitreal lens nucleus and lens fragments were uveitis, increased intraocular pressure, corneal edema, optic atrophy, retinal detachment and vitreous hemorrhage (Table 4). Optic atrophy was found in four patients after couching with secondary glaucoma and one patient after trauma. There were three cases of preoperative retinal detachment, one case was post traumatic and two cases were post couching.

A three-port pars plana vitrectomy with a limbal extraction was performed in 27 cases (28 eyes) of patients with hard lens nucleus and large lens fragments. Three of 28 eyes had the additional circumferential scleral buckling procedure due to preoperative retinal detachment. The lens nucleus and lens fragments in all cases were successfully removed. Postoperative complications were corneal edema with striate keratopathy which appeared with the wrinkling of Descemet's membrane, persistent increased intraocular pressure, mild retinal hemorrhage, vitreous hemorrhage, hyphema, choroidal detachment, and retinal detachment (Table 5). Mild

Table 2. Causes of lens dislocation.

Causes	No. of eyes	%
Post couching	20	45
Following phacoemulsification	13	30
Trauma	9	20
Marfan's syndrome	2	5

Table 3. Duration of retained intravitreal lens material.

Duration	Lens nucleus No. of eyes	Lens fragments No. of eyes
1-4 weeks	6	9
5-8 weeks	3	2
3-6 months	3	2
1-4 years	5	-
5-10 years	14	-
Total	31	13

Table 4. Complications of retained intravitreal lens material.

	No. of eyes (n=44)	%
Uveitis	25	61
Increased intraocular pressure	25	61
Corneal edema	10	24
Optic atrophy	5	12
Retinal detachment	3	7
Vitreous hemorrhage	2	5

Table 5. Postoperative complications.

Complications	No. of eyes (n=44)	%
Corneal edema with striate keratopathy	10	23
Persistent increased intraocular pressure	2	5
Hyphema	2	5
Retinal hemorrhage	2	5
Vitreous hemorrhage	2	5
Choroidal detachment	1	2
Retinal detachment	1	2

retinal hemorrhage and some vitreous hemorrhage occurred during vitrectomy while cutting the vitreous adhesions. Hyphema occurred due to limbal incision and accidental injury to the iris. These complications could be treated with medical treatment except two cases of uncontrolled secondary glaucoma with peripheral anterior synechia requiring treatment with trabeculectomy. Late retinal detachment was found in one case 6 weeks after the operation. In this patient lens nucleus dropped during phacoemulsification, the vitreous had much postoperative inflammation and tractional retinal detachment developed. The patient refused a further operation.

Preoperative visual acuity was 6/60 or better in 18 eyes (41%), worse than 6/60 in 26 eyes (59%). After the lens removal, the final postoperative visual acuity improved in 35 eyes, remained stable in 4 eyes and decreased in 5 eyes. (Fig. 2) Thirty eyes required visual correction with glasses or contact lenses, 4 eyes had a scleral fixation of intraocular lens during the lens removal and 10 eyes had an initial in sulcus intraocular lens implantation before lens fragments removal. The postoperative visual acuity was 6/12 or better in 14 eyes (32%) 6/18 to 6/60 in 23 eyes (52%) and worse than 6/60 in 7 eyes (16%) The causes of the poor visual outcome (< 6/60) included 4 cases of chronic glaucoma with optic atrophy, one case of post traumatic optic atrophy and 2 cases of retinal detachment.

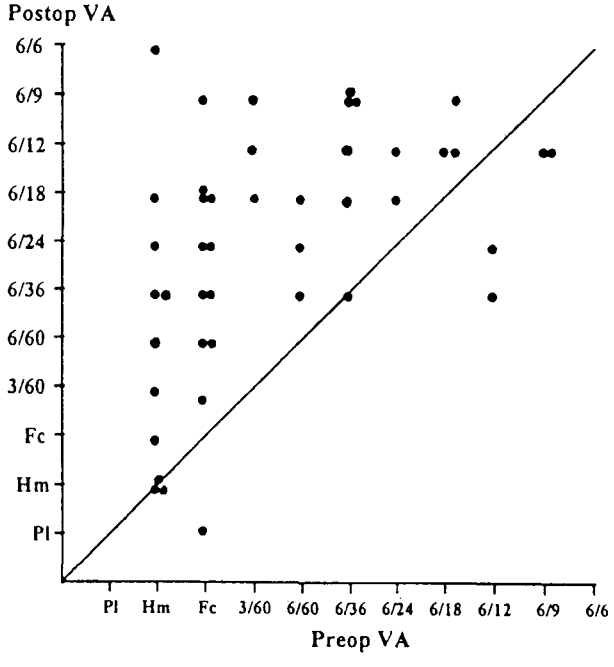

Fig. 2. Preoperative and postoperative visual acuity.

DISCUSSION

The common complications of retained lens material in the vitreous are uveitis, elevated intraocular pressure and corneal edema[3-6,12]. The ocular inflammation may be found as early as within one week[5]. The degree of inflammatory response seems to be related to the amount of retained lens material. If the lens fragment is small and there is not much vitreous inflammation, only medical treatment is indicated but for the total nucleus especially with intact lens capsule, the eye may have no or less inflammation for many years. In our series, in half of the patients caused by couching, the nucleus with intact lens capsule remained inside the eye for many years until severe inflammation developed. In case of a total dropped nucleus with intact lens capsule, if the inflammation is mild it is not so urgent to perform an operation and the surgeon can plan to remove the lens as an elective case.

The operation for removal of hard lens nucleus or large lens fragments generally can be performed by vitrectomy with ultrasonic fragmentation. The nucleus should be fragmented in the middle of the vitreous cavity. If the nucleus is hard, it can be crushed between the light pipe and ultrasonic fragmentation probe. This technique sometimes has an increased risk of intraoperative retinal detachment due to much manipulation within the vitreous cavity. Another method is to remove the lens through a corneal incision by using perfluorocarbon liquid to float the lens up[10]. After the lens is removed, the perfluorocarbon liquid-air exchange has to be performed. Peyman GA, et al described a method of removing a hard dislocated lens in vitreous by lifting the hard lens with a needle and bringing it into the anterior chamber and then removing it through a clear corneal incision[13].

In our technique, we used vitrectomy probe to engage the lens nucleus. The vacuum pressure at 300 mmHg was high enough to pull the lens up to the anterior chamber. This method is safe and it does not require any perfluorocarbon

liquid. There is no sharp instrument inside the eye and less manipulation on the retinal surface. Postoperative corneal edema with striate keratopathy were found in 10 eyes. This complication caused by mechanical injury to the endothelium of cornea as we pushed the lens into the anterior chamber or as we removed the lens through a limbus. It could be avoided by injecting viscoelastic agent to coat the endothelium and opening the corneal incision wide enough while delivering the lens. In our series there was no intraoperative retinal detachment. Only one case had a late postoperative retinal detachment. We think that in case of severe ocular inflammation, removing of the basal vitreous gel as much as possible may have a role in preventing vitreous traction and retinal detachment. The disadvantage of removal of a large lens fragment through a corneal incision was the postoperative astigmatism which is found more often than in the phacofragmentation technique. However, this technique can be performed in combination with a scleral fixation of intraocular lens which needs to enlarge the corneal wound.

In conclusion, hard lens nucleus or large lens fragments in the vitreous can be removed by a standard three-port pars plana vitrectomy with a limbal extraction. The technique of pulling the lens by a vitrectomy probe with high vacuum suction is an alternative method for those who have only a simple vitrectomy machine.

(Received for publication on March 17, 1998)

REFERENCES

1. Fastenberg DM, Schwartz PL, Shakin JL, Golub BM. Management of dislocated nuclear fragments after phacoemulsification. Am J Ophthalmol 1991;112:535-9.
2. Blodi BA, Flynn HW Jr, Blodi CF, Folk JC, Daily MJ. Retained nuclei after cataract surgery. Ophthalmology 1992;99:41-4.
3. Hutton WL, Snyder WB, Vaiser A. Management of surgically dislocated intravitreal lens fragments by pars plana vitrectomy. Ophthalmology 1978;85:176-89.
4. Gilliland GD, Hutton WL, Fuller DG. Retained intravitreal lens fragments after cataract surgery. Ophthalmology 1992;99:1263-9.
5. Ross WH. Management of dislocated lens fragments following phacoemulsification surgery. Can J Ophthalmol 1993;4:163-6.
6. Kim JE, Flynn HW, Smiddy WE, et al. Retained lens fragments after phacoemulsification. Ophthalmology 1994;101:1827-32.
7. Lambrou FH, Stewart MW. Management of dislocated lens fragments during phacoemulsification. Ophthalmology 1992;99:1260-2.
8. Kapusta MA, Chen JC, Lam WC. Outcomes of dropped nucleus during phacoemusification. Ophthalmology 1996;103:1184-7.
9. Lewis H, Blumenkranz MS, Chang S. Treatment of dislocated crystalline lens and retinal detachment with perfluorocarbon liquids. Retina 1992; 12:299-304.
10. Wallace RT, McNamara JA, Brown G, et al. The use of perfluorophenanthrene in the removal of intravitreal lens fragments. Am J Ophthalmol 1993;116:196-200.
11. Borne MJ, Tasman W, Regillo C, Malecha M, Sarin L. Outcome of vitrectomy for retained lens fragments. Ophthalmology 1996;103:971-6.
12. Vilar NF, Flynn HW, Smiddy WE, Murray TG, Davis JL, Rubsamen PE. Removal of retained lens fragments after phacoemulsification reverses secondary glaucoma and restores visual acuity. Ophthalmology 1997;104:787-92.
13. Peyman GA, Raichand M, Goldberg MF, Ritacca D. Management of subluxated and dislocated lenses with the vitrophage. Br J Ophthalmol 1979; 63:771-8.

การผ่าตัดรักษาเลนส์ตาเคลื่อนและเศษเลนส์ที่ค้างอยู่ในวิเทรียส

อภิชาติ สิงคาลวณิช, พ.บ., ภารพันธ์ บำรุงสุข, พ.บ.**

ได้ทำการศึกษาผู้ป่วยที่มีเลนส์ตาเคลื่อนหรือมีเศษเลนส์ค้างอยู่ในลูกตา 43 ราย (44 ตา) ที่มารับการผ่าตัดรักษา ณ ภาควิชาจักษุวิทยา คณะแพทยศาสตร์ศิริราชพยาบาล พบสาเหตุของเลนส์ตาเคลื่อน เกิดจากการลอกต้อกระจกโดยวิธีใช้เข็มเขี่ย (post-couching) การสลายต้อด้วยเครื่องเสียงความถี่สูง เกิดจากอุบัติเหตุ และกลุ่มโรคมาร์ฟาน ผู้ป่วย 16 ราย (ร้อยละ 36) มีเศษเลนส์เล็กๆค้างอยู่ในวิเทรียส และผู้ป่วย 28 ราย (ร้อยละ 64) มีเลนส์นิวเคลียสหรือเศษเลนส์ที่ใหญ่กว่าครึ่งหนึ่งของนิวเคลียสค้างอยู่ในตา ผู้ป่วยที่มีเศษเลนส์เล็กๆ ทำการผ่าตัดโดยใช้เครื่องตัดน้ำวุ้นในลูกตา ผู้ป่วยที่มีเศษเลนส์ใหญ่หรือมีเลนส์นิวเคลียสค้างอยู่ในวิเทรียส ทำการดูดเลนส์ที่จมค้างอยู่ให้ลอยขึ้นมา โดยการดูดด้วยปลายเครื่องมือที่ใช้ตัดวิเทรียส โดยใช้แรงดูดสูญญากาศประมาณ 300 มิลลิเมตรปรอท ดึงเลนส์เข้ามาอยู่ในช่องหน้าลูกตา และนำเลนส์ออกผ่านทางแก้วตา ก่อนผ่าตัดผู้ป่วยมีระดับสายตา 6/60 หรือดีกว่าจำนวน 18 ตา (ร้อยละ 41) และระดับสายตาต่ำกว่า 6/60 26 ตา (ร้อยละ 59) หลังการผ่าตัด เมื่อแก้ไขโดยแว่นหรือคอนแทคเลนส์แล้ว ผู้ป่วยมีระดับสายตา 6/60 หรือดีกว่าจำนวน 37 ตา (ร้อยละ 84) และระดับสายตาต่ำกว่า 6/60 7 ตา (ร้อยละ 16) การผ่าตัดโดยการดูดเลนส์ขึ้นมาจากวิเทรียสด้วยปลายเครื่องตัดวิเทรียสที่มีแรงดูดสูญญากาศสูงเป็นวิธีที่ง่าย ประหยัดและค่อนข้างปลอดภัย

* ภาควิชาจักษุวิทยา, คณะแพทยศาสตร์ศิริราชพยาบาล, มหาวิทยาลัยมหิดล, กรุงเทพ ฯ 10700