

# Efficacy of Removing Dislocated Lens using Intravitreal Phacoemulsification

Haijiang Zhang, Jieyu Dong, Kun Jin, Guohua Wang, Daling Xu, Ming Huo\*

Department of Ophthalmology, the First College of Clinical Medicine, Three Gorges University of China; Yichang Central People's Hospital, Yichang 443003, China

## Abstract

**Purpose:** To evaluate the efficacy of intravitreal phacoemulsification in the removal of dislocated crystalline lenses.

**Methods:** Twenty-two cases (22 eyes) with posterior dislocated lens induced by ocular trauma or capsule rupture during phacoemulsification between January 2008 and December 2010 were retrospectively analyzed in this study. Total vitrectomy was first performed through standard closed three-port incisions at the pars plana, and dislocated lenses were removed using the phacoemulsification tip without the silicone sleeve. Extraction of intraocular foreign body, endolaser retinal photocoagulation and intraocular lens implantation were performed simultaneously. Visual acuity, intraocular pressure (IOP) and postoperative complications were assessed over 1 to 3 months of follow up.

**Results:** All dislocated lenses were extracted without severe complication. The final corrected visual acuity was  $\geq 6/15$  in 7 cases,  $6/100-6/18$  in 5 cases and  $\leq 6/120$  in 10 cases, a significant improvement over preoperative values ( $P < 0.05$ ). The IOP in 10 cases (10 eyes) with secondary glaucoma was  $< 21$  mmHg post-operatively. Intraocular foreign bodies in 3 eyes were removed. Nine patients (9 eyes) underwent intraocular lens implantation. No instances of retinal detachment, retinal hemorrhage or scleral wound burn were observed after surgery.

**Conclusion:** Intravitreal phacoemulsification combined with vitrectomy yielded good efficacy and safety in the treatment of posteriorly dislocated lens. It may be an alternative to phacofragmentation in the treatment of posteriorly dislocated lenses. (*Eye Science* 2012; 27:34-36)

**Keywords:** dislocated lens; phacoemulsification; vitrectomy

**B**ecause of ocular trauma and rupture of posterior capsule during phacoemulsification, dislocated lens frequently occurred in the vitreous cavity and

complicated with vitreous hemorrhage, secondary glaucoma, retinal detachment, or intraocular foreign body, etc. At present, intravitreal phacofragmentation and perfluorocarbons are mainly adopted to cure dislocated lens and to extract dislodged lens from anterior segment<sup>1</sup>. In this study, however, the authors performed posterior vitrectomy and intravitreal phacoemulsification to treat 22 cases of dislocated lens, achieving desirable therapeutic effects.

## Materials and Methods

### General information

Twenty-two patients (22 eyes) with dislocated lens in the vitreous cavity were admitted to Yichang Central People's Hospital between January, 2008 and December, 2010. The medical history ranged between 1 week and 3 years. Seventeen cases were male and five were female, aged from 30- to 75-year-old. Sixteen patients suffered from ocular trauma; eight cases were complicated with secondary glaucoma, three cases with penetrating corneal injury, and three cases with intraocular foreign body. Vitreous hemorrhage of various degrees was observed in 16 cases. Lens nucleus was dislodged into the vitreous cavity in the remaining six cases caused by posterior capsule rupture intraoperatively, two of whom had secondary glaucoma. The study followed the tenets of the Declaration of Helsinki.

### Preoperative preparation

The patients with intraocular hemorrhage were told to rest in a semirecumbent position. Those with secondary glaucoma received IOP-lowering agents and underwent local or systemic anti-inflammation therapy. In addition, assisted examinations such as ultrasound biomicroscope (UBM), ocular B-ultrasound, CT, etc., were conducted.

## Operation procedure

After conventional retrobulbar and subconjunctival anesthesia, the patients with penetrating corneal injury underwent micro-suturing, and then the total vitrectomy (including the vitreous base and pars plana) through triple sclera incisions (3 mm posterior to corneal limbus). The vitreous hemorrhage and opacification were completely removed to free the dislocated lens. Then, intravitreal phacoemulsification was applied (Alcone LEGACY 20000, the United States): flared ABS phaco tip (diameter=0.84 mm), 350 mmHg vacuum, 60% energy power, and 28 cc/min flow and pulse mode (system parameters). An ABS phaco tip without the silicone sleeve was punctured into the vitreous cavity through sclera incisions, which was connected to the irrigation tube and aspiration tube. Rotated chipping phacoemulsification was performed under highly negative pressure, which could fix the lens on the phaco tip distant from the retina and the middle- and anterior-segments of vitreous cavity. Under the assistance of an optical fiber head, phacoemulsification of lens was processed at a pulsed frequency of 15 times/second. The procedure above was repeated if the lens nucleus was detached from the phaco tip. Residual lens cortex was eliminated using a vitrectomy cutter. Intraocular foreign bodies were extracted and traumatic retinal damages were treated by retinal laser photocoagulation. Whether primary suture-fixed IOL implantation was performed depended upon the patient's fundus status. Routine antibiotics, local and systemic steroid hormone, compression bandaging, and other symptomatic treatments were administrated postoperatively. The patients were discharged one week postoperatively and were followed-up for one to three months.

## Results

### Patients' information

Intravitreal phacoemulsification was successfully performed in all 22 patients. The hardness of dislocated lens nuclear was graded between I and IV, including one case of grade I, eight cases of grade II, 11 cases of grade III and two cases of grade IV. Three patients with penetrating corneal injury underwent corneal debridement and suturing; three cases

with retinal damages caused by intraocular foreign bodies located outside the macular region were treated by laser photocoagulation. Nine cases received the suture-fixed IOL implantation.

### Visual acuity and IOP

The final corrected visual acuity was  $\geq 0.4$  in seven cases, 0.06~0.3 in five cases, and  $\leq 0.05$  was in 10 cases, significantly different from those preoperatively ( $P < 0.05$ ). For the patients with secondary glaucoma, the IOP of eight cases decreased to normal level postoperatively and the IOP of another two cases was controlled by IOP-lowering eye drops.

### Surgical complications

No retinal holes or retinal detachment was observed intraoperatively. Neither burning sensation nor contraction adjacent to sclerotomy sites was noted. The incisions were well sutured and no leakage fluid was found.

## Discussion

The lens nucleus might be dislocated due to ocular trauma or cataract phaco surgery. Ocular trauma was likely to generate powerful force by compression at lens sagittal plane and expansion of the equatorial region, which could be conducted through the aqueous humor. In addition, the lens capsule and zonules were ruptured by distention of the lens zonules or direct impact of the foreign body, which induced dislocated or subluxated lens, accompanied by multiple complications, such as secondary glaucoma, vitreous hemorrhage, retinal hole, ciliary body detachment, or iridodialysis, etc. Long-term retention of the lens in the vitreous cavity yielded at least three potential risks: first, the leakage of dissolved lens was likely to cause phacolytic glaucoma; second, it might induce allergic uveitis; third, dislocated lens impacted vitreous and retina according to the changes of human position, and it interfered with the normal functions of vitreous and retina<sup>2</sup>. For those patients with complete lens dislocation in vitreous cavity, most scholars performed operations to treat the dislocated lens.

At present, pars plana vitrectomy surgery is the most frequently used treatment to cure lens dislocation. Lens phacofragmentation can be successfully conducted assisted by the tip's high vacuum or per-

fluorocarbon. Another approach is to extract the lens from the corneal limbal incision using perfluorocarbon, enabling the lens to float within anterior and middle segments of the vitreous cavity. However, the phacoemulsification utilizing the phaco tip without silicone sleeve has rarely been reported<sup>3</sup>.

Many hospitals, especially those in rural areas, are not equipped with a phacofragmentation system, which is an optional equipment of the vitreous cutter. Thus, complete lens dislocation was either handled by the vitreous cutter tips directly or extracted from the corneal incision. It is time-consuming, difficult and risky to tackle the retina using the first method if the lens nucleus is hard, while the second approach yields large wounds, which requires perfluorocarbon. With the improvement of phacoemulsification instruments and upgrade of phaco tips, phacoemulsification system gains many advantages, such as high vacuum, low energy, cold ultrasound, and low heat production, etc. In this study, we utilized the Alcone LEGACY 20000 phacoemulsification instrument and flared ABS phaco thin tips. The diameter of Flared ABS tip (without the silicone sleeve) was 0.84 mm, while the diameter of sclera puncture incision was 0.89 mm (made by the sclera blade), which enabled the tips to easily penetrate the sclera puncture hole and absorb the lens nucleus by producing a high vacuum. In addition, the phacoemulsification instrument could produce a negative pressure, ranging from 350 and 500 mmHg, significantly exceeding the negative pressure (150 mmHg) of vitreous cutter (fixed or ratio type).

Above all, this technology was a safe, convenient, and fast treatment of nucleus of dislocated lens. However, the heat produced during the process of phacoemulsification would cause collagen fiber shrinkage and burn the sclera puncture incision. To avoid these damages, the authors removed the sleeve of the phaco tip to allow the irrigation liquid to flow out continuously and to cool the tissues surrounding the edge of scleral puncture incisions and the phaco tip. In addition, the irrigated liquid from another scleral puncture incision cooled the intraocular tissues and the tip. After removing the lens nucleus,

small fragments could be eliminated by the vitreous cutter. In this study, total vitrectomy was performed in the treatment of traumatic lens dislocation<sup>6</sup>. First, it could fully free and absorb the lens, which minimized retinal injuries induced by vitreous traction. Second, it could remove the vitreous body, inflammatory mediators, and vitreous hemorrhage completely, which reduced the incidence of sclerotomy-induced complications and prevented proliferative vitreoretinopathy.

In this study, 22 cases of posterior lens dislocation were treated by intravitreal phacoemulsification, which yielded desirable effects. This technology integrated the characteristics of phacoemulsification instruments, including high vacuum, low energy, and cold ultrasound, and avoided the shortcomings of phacofragmentation (lower vacuum, higher energy, fewer parameters and longer surgical time), which probably caused macular edema and retinal damage. Moreover, it was performed directly without perfluorocarbons, which induced retinal damage. Thus, the intravitreal phacoemulsification combined with vitrectomy is regarded as a promising clinical treatment of posterior dislocation of the lens.

## References

- 1 Xia FH, Wu NC, Han LR, et al. A clinical study on vitreoretinal surgery combined with different operating method for dislocation of lens. *Journal of Clinical Ophthalmology*, 2007;15:37-38.
- 2 Li QT, Liang Y. Status quo and prospects of surgical treatment of dislocation of lens. *International Journal of Ophthalmology*, 2009;9:511-513
- 3 Zhong JX, Zhao YJ. Surgical techniques about whole or broken lens dropped in vitreous cavity. *Chinese Journal of Ocular Trauma and Occupational Eye Disease*, 2004; 26:591-593.
- 4 Augenklinik DS, Krankenstalten BM. Phacoemulsification of the dislocated lens nucleus in the vitreous body. *Klin Monatsbl Augenheilkd*, 1995;206: 456-459.
- 5 Stadt, Kliniken M, Augenklinik, et al. Phacoemulsification of a nucleus in the vitreous cavity. *J Cataract Refract Surg*, 1997;23:985-989.
- 6 Liu W. *Microsurgery of retinal detachment (the 1st edition)*. Beijing: People's Medical Publishing House, 2007: 333.