

## original article

**VISUAL OUTCOME AFTER PARS PLANA VITRECTOMY AND PHACO-FRAGMENTATION IN PATIENTS OF DROPPED NUCLEUS**

Haniyaa Mufti, Syed Tariq Qureshi, Shahnawaz Shafi, Tufela Shafi

**Abstract:****Purpose:**

To evaluate the visual outcome in patients who underwent phaco-fragmentation and pars planavitrectomy (PPV) for posteriorly dislocated nucleus following cataract surgery.

Methods: A hospital based prospective observational study was conducted on 50 eyes of 50 patients with posteriorly dislocated nucleus after cataract surgery who underwent PPV. Preoperative data including age, sex, visual acuity, status of anterior and posterior segment, intraocular pressure, details of cataract surgery, status of IOL (intraocular lenses), risk factors, and clinical associations at the time of PPV were obtained. Final visual acuity, IOP, and complications were recorded. All patients were followed up for 6 months.

**Results:**

Out of 50 patients, only 18 (36%) patients had the presence of well-defined or confirmed risk factors and in 32 (64%) patients, the risk factors were unknown or not documented. The clinical associations included anterior chamber (AC) reaction, corneal edema, lens matter in AC, hyphaema, iridodialysis, vitritis, and vitreous hemorrhage. 29(58%) patients had primary IOL implantation done at the time of cataract extraction and 21 (42%) referred patients who were kept aphake following nucleus drop had secondary IOL implantation done at the time of PPV. Majority of patients i.e. 30 (69.77%) had a visual acuity of HM(hand movements) – PR (projection of rays) after nucleus drop, while 10 (23.26%) patients had visual acuity of finger counting. At the final follow up after PPV, best corrected visual acuity (BCVA) was in the range of 6/6-6/18 in 30 (60%) patients, 15 (30%) were observed to have a BCVA of < 6/18-6/60.

**Conclusion:**

Our study concludes that pseudo-exfoliation, phacodonesis, floppy iris and myopia are some of the frequently associated risk factors for nucleus drop. Visual outcome after nucleus drop is good in most of the patients after PPV. The rise in IOP is seen in majority of the patients after nucleus drop and this reduces significantly when managed by pars planavitrectomy.

**JK-Practitioner2020;25(1-4):44-49****Authors Affiliations**

**Haniyaa Mufti, Syed Tariq Qureshi**, Professor and HOD,  
**Shahnawaz Shafi, Tufela Shafi**.

Post Graduate Department of  
Ophthalmology,  
Govt. Medical College, SMHS,  
Karanagar

**Correspondence**

Dr. TufelaShafi  
Department of Ophthalmology,  
Govt. Medical College, Srinagar |  
Email: drtufelashafi@gmail.com ;  
+917006825250

**Indexed**

Scopus, IndMED, EBSCO &  
Google Scholar among others

**Cite this article as:**

Mufti H, Qureshi ST, Shafi S,  
Shafi T. Visual outcome after pars  
planavitrectomy and phaco-  
fragmentation in patients of  
dropped nucleus  
JK-Practitioner2020;25(1-4):44-49

**Introduction**

Displacement of the lens nucleus into the vitreous cavity after cataract surgery is well documented and has earlier been reported to have incidences of 0.3%-2.7%.<sup>1-6</sup>. It is a well known and severe complication that can occur during cataract surgery. With Phaco-emulsification emerging as the preferred surgical method for cataract extraction nowadays, complications like posterior capsule rupture and nucleus drop are also reported to occur commonly especially during the surgeon's learning phase.<sup>7-14</sup>. While phacoemulsification has several advantages, and a high safety profile, the complication like posterior nuclear dislocation is potentially serious and can lead to a sight threatening sequelae if not managed well in time. The complications of retained lens material include corneal edema, intraocular inflammation leading to secondary glaucoma,

Full length article available for  
download at [jkpractitioner.com](http://jkpractitioner.com)  
two months after publication

**Key Words:** cataract surgery,  
visual outcome, phaco-  
emulsification, dropped nucleus,  
pars planavitrectomy.

uveitis, cystoid macular edema (CME), increased intraocular pressure (IOP), rhegmatogenous retinal detachment (RD), vitreous hemorrhage and decreased visual acuity<sup>7,9,11,12, 15-26</sup>.

Pars plana vitrectomy (PPV) for posteriorly dislocated lens fragments has been reported to be associated with visual acuity improvement and reversal of secondary glaucoma in most patients. The current study also evaluates the visual outcome in patients undergoing 23G three port PPV to manage posteriorly dislocated lens fragments following cataract extraction.

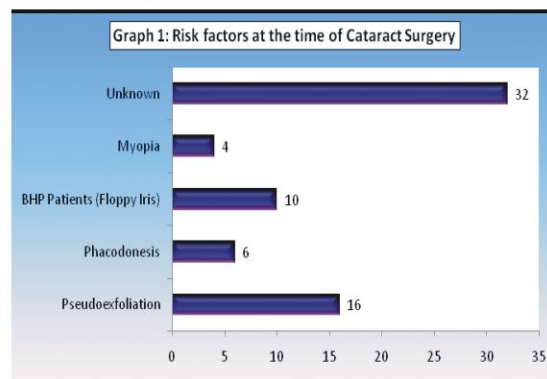
## PATIENTS AND METHODS

It was a hospital based prospective observational study conducted on 50 eyes of 50 patients with posteriorly dislocated nucleus after cataract surgery who underwent PPV in the Postgraduate Department of Ophthalmology, Government Medical College and Hospital, Srinagar, Jammu and Kashmir, from September 2017 to April 2019. Patients who presented with only cortical fragments of the lens, or with nuclear fragment dislocation from trauma or any other cause other than cataract extraction were excluded. Patients with any pre-existing cause, like glaucoma or vascular occlusion that would affect the final visual outcome were also excluded. For referred cases, after obtaining informed consent a detailed preoperative ocular and relevant medical and surgical history was taken. Preoperative data was also obtained from the patient's records including age, sex, visual acuity, anterior segment details, status of fundus, intraocular pressure, details of cataract surgery, risk factors at the time of cataract extraction, type and status of IOLs, and clinical associations at the time of PPV. All patients entering into the study underwent a complete eye examination including visual acuity (VA) testing, intraocular pressure (IOP) measurement, slit-lamp examination, a dilated fundus examination and B-scan in cases of media opacities. Other study variables included the details of the procedure, operative complications, final visual acuity, IOP, and complications after PPV. When facing a case of nucleus drop in our hospital, an immediate referral to vitreo-retinal surgeon was made after proper wound closure, for same day PPV. The referred cases were either operated on the same day depending on media clarity and status of the eye, or otherwise patients were managed with an elective 23G PPV later. All the cases were operated by a single surgeon. All the patients were followed up at 1 week, 1 month, 3 months and 6 months with BCVA, IOP

measurement, Slit lamp examination, dilated fundus examination and optical coherence tomography (OCT).

## RESULTS:

Of the 50 patients (50 eyes), majority of the patients were males 29 (58%) while only 21 (42%) were females. The mean age of patients in our study was 64.6±9.41 years (range, 45-75 years). As shown in graph 1, out of 50 patients, only 18 (36%) patients had the presence of risk factors where pseudoexfoliation was present in 8 (16%), Floppy Iris in 5 (10%) patients, 3 (6%) patients had phacodonesis and myopia was seen in 2 (4%) patients. In 32 (64%) patients, the risk factors were unknown. Preoperative data revealed that phacoemulsification was performed in 31 (62%) patients, whereas only 19 (38%) patients underwent manual SICS.



After cataract extraction, 21 (42%) patients were kept aphake and 29 (58%) were pseudophake. Out of 29 pseudophakic eyes, PCIOL was put in sulcus in 27 (93.10%) patients and ACIOL was put in 2 (6.90%) of patients. In patients left aphake after cataract surgery (n=21), PCIOL was put in sulcus in 16 (76.19%), iris claw lens was put in 3 (13.29%) and ACIOL was put in 2 (9.5%) patients at the time of PPV.

As shown in Graph 2, the clinical associations in patients when they presented for PPV was AC reaction in 21 (42%) patients, vitritis was noted in 8 (16%), and corneal edema in 7 (14%) patients. Vitreous hemorrhage was seen in 5 (10%) patients, lens matter in AC was noted in 4 (8%) of patients, whereas hyphaema was seen in 2 (4%) patients, iridodialysis was seen in 2 (4%) patients.



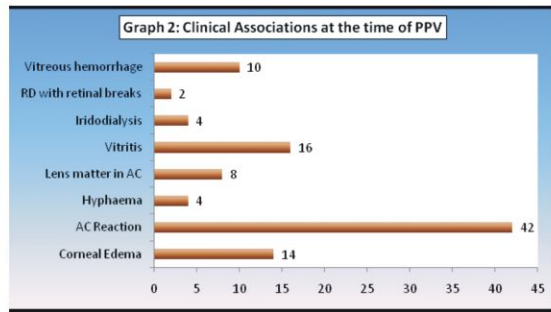


Table 3 reveals that the majority of patients i.e. 30 (69.77%) had a visual acuity of HM-PR after nucleus drop, while 10 (23.26%) patients had visual acuity of finger counting, 2 (4.65%) patients had visual acuity 5/60 to 1/60 and only 1 (2.32%) had visual acuity of 6/18 to 6/60. Visual acuity could not be recorded before PPV in 7 patients who underwent PPV in the same sitting.

Table 3: Visual acuity after Nucleus drop (before PPV) n=43		
VA	Frequency	Percentage (%)
6/18 - 6/60	1	2.32
5/60 - 1/60	2	4.65
Finger counting	10	23.26
Hand Movements - PR+	30	69.77

Table 4: Visual outcome after PPV				
BCVA	1 Week	1 Month	3 Month	6 Month
6/6-6/18	0 (0.0)	8 (16%)	13 (26%)	30(60%)
<6/18 to 6/60	0 (0.0)	22 (44%)	28 (56%)	15(30%)
<6/60 to 3/60	6 (12%)	6 (12%)	4 (8%)	1(2%)
<3/60 to 1/60	20 (40%)	7 (14%)	2 (4%)	1(2%)
<1/60 to PR	24 (48%)	7 (14%)	3 (6%)	3(6%)

Table 4 shows postoperative visual outcome after PPV was 6/6 to 6/18 in 8(16%) eyes at 1 month, in 13 (26%) eyes at 3 months and in 30 (60%) eyes at 6 months, while only 15 (30%) had visual acuity in the range of 6/18 to 6/60 and 5 (10%) patients had visual acuity of <6/60 at the final follow up. Causes of Visual acuity < 6/60 after PPV for Nucleus Drop in 5 patients were presence or RD in 2 (4%) patients, while uveitis, secondary glaucoma and CME was seen in 1 (2%) eye each.

Table 5: Various complications among study patients			
Complications		No. of Eyes	%age
Early postoperative (<2weeks)	Fibrous reaction	22	44.0
	Hyphaema	2	4.0
	Uveitis	1	2.0
	Pre-retinal haemorrhage	5	10.0
Late postoperative (2 weeks - 6 months)	CME	1	2.0
	RD	2	4.0
	High IOP	1	2.0

The complications were divided into early postoperative and late post operative. Early complications (that occurred within 2 weeks of PPV) included fibrous reaction was seen in 22 (44%) eyes, followed by pre-retinal hemorrhage in 5 (10%) eyes, hyphaema in 2 (4%) eyes and uveitis in 1 (2%) eye.

Late postoperative (2 weeks to 6 months) complications noted were RD in 2(4%) eyes, and CME and high IOP in 1 (2%) eye.

## DISCUSSION

Outcomes of dropped nucleus after cataract surgery has been studied and well documented over the years and with phacoemulsification emerging as the preferred choice for many cataract surgeons, an apparent surge in the occurrence of retained lens fragments has been reported. In our study also posterior dislocation of nucleus occurred more commonly after phacoemulsification i.e in 31 (62%) patients as compared to 19 (38%) patients where the catastrophe occurred after manual small incision cataract surgery (MSICS). Our findings are consistent with the studies by Bose S et al (2017)<sup>27</sup> who conducted a study to study the factors predicting the visual outcome of pars planavitrectomy (PPV) done for dislocated crystalline or artificial intraocular lens (IOL) on 58 patients where 36 patients had iatrogenic dislocation related to cataract surgery. They have also found that out of 36 patients, 26 (72.2%) underwent phacoemulsification, and 10 patients (27.8%) underwent manual small-incision cataract surgery (MSICS). They observed that the odds of phacoemulsification causing dislocation of nucleus into vitreous are 6.8 times higher as compared to SICS (P = 0.001). The results in above mentioned study are consistent with our study, showing that posterior dislocation can occur in any technique of cataract extraction, but is more commonly found to occur with phacoemulsification. This has been attributed to many factors like difficulty in assessing the depth during sculpting, perforation of the nuclear plate at 6 o'clock during grooving, and cracking and persistent aspiration after fragment removal.

A three port 23G transconjunctival microcanula based sutureless vitrectomy was used in all cases of our study to retrieve the dropped nucleus. Smaller nuclear fragments were removed by the vitreous cutter itself whereas the cases of large or hard nuclear fragments which posed difficulty with the vitreous cutter, the sclerotomy was enlarged to accommodate a 20G phaco-fragmentome hand-piece. Nuclear fragments were floated up with perfluorocarbon



liquid (PFCL) and brought into the mid-vitreous cavity where intra-vitreous phacoemulsification was done. Secondary IOL implantation was done in aphake patients. Careful peripheral examination was done and any retinal tear was sealed with endolaser.

In our study, patients with pre-existing increased IOP or documented glaucoma were excluded. We observed that following nucleus drop, majority of the patients 24 (55.81%) in our study had IOP in the range of 19-24mmHg, 16 (37.2%) patients had IOP <18 mmHg and IOP of >25mmHg was seen in 3 (6.98%) patients. IOP was not recorded in 7 patients who underwent PPV in the same sitting. This rise in IOP after nucleus drop could be because of the inflammation caused by retained lens matter or the use of topical steroids. The final IOP after PPV observed in our study was <18mmHg in 32 (64%) of the patients, 17 (34%) patients had IOP in the range of 19-22 mmHg, while only 1 (2%) patient had IOP > 23mmHg, hence proving the considerable decrease in IOP following PPV which is consistent with the following studies by Kapusta MA et al (1996)<sup>13</sup> and Gilliland GD et al (1992)<sup>9</sup>. Kapusta MA et al (1996)<sup>13</sup> evaluated the clinical outcome of vitrectomy in the management of dropped nucleus during phacoemulsification. Intraocular pressure in their study was measured as greater than 25mmHg by applanation tonometry in 60% of the patients following nucleus drop:

We also observed the clinical association in patients with retained lens matter at the initial presentation for PPV in our study. AC reaction was the most common association in 21 (42%) patients, followed by vitritis in 8 (16%), corneal edema in 7 (14%), vitreous hemorrhage in 5 (10%) patients, lens matter in AC in 4 (8%) patients, hyphema in 2 (4%), and iridodialysis was seen in 2 (4%) patients. RD with retinal breaks was present only in 1 (2%) patient before PPV. A study by Al-Amri AM (2008)<sup>28</sup> had also reported similar findings with corneal edema (39%) being the most common association and retinal detachment (2.7%) least common. Another study by Bose S et al (2017)<sup>27</sup> also reported corneal edema in 4 (6.9%), uveitis in 2 (3.4%), and VH in 4 (6.9%) patients.

The incidence of RD before PPV in our study was low (2%) which may indicate that present cataract surgeons are being more careful, deal with dropped nuclei patiently and do not attempt to retrieve the posteriorly dislocated lens material with methods that can cause vitreous and retinal traction. Out of 50 patients in our study, none was left Aphake after PPV. 29 (58%) had primary IOL implantation done at the time of cataract extraction. The 21 aphake

patients had secondary IOL implantation done at the time of PPV. PCIOL was put in sulcus in patients where adequate capsular support was present. In the absence of capsular support, ACIOL's and iris claw lenses were put in. At the end, PCIOL was put in sulcus in 43 (86%), ACIOL in 4 (8%), and iris claw lens was put in 3 (6%) patients. This report is not very different from other series reported by Lai TYY (2005)<sup>29</sup>, where the post vitrectomy lens status observed was that 21 (72%) of the 29 patients had posterior chamber intraocular lens (PCIOL) implanted in the sulcus, 3 patients (10%) received scleral-fixated intraocular lens (SFIOL), 2 (7%) patients had anterior chamber intraocular lens (ACIOL) implanted, and 3 patients (10%) were left aphake due to poor pre-existing eye condition.

In another study by vonLany HV et al (2008)<sup>30</sup>, 60% of eyes were left without a primary IOL after the cataract surgery and secondary IOL was implanted at the time of vitrectomy. Overall, 74% of eyes were pseudophakic, and 26% were aphakic, at the time of final follow-up in their study.

Our study differs from the above studies, as 29 (58%) of the patients in our study received primary IOL as compared to 40% in the study by von Lany HV et al (2008)<sup>30</sup>. 42% patients were left aphake after CE in our study which is less as compared to the 60% patients left aphake in the above study. The 21 (42%) who were kept aphake after primary surgery in our study, had IOL implantation done at the time of PPV where as in the above study, 21% patients were kept aphake even after PPV. The final pseudophakic status in all our study patients points towards better decision making, meticulous surgical techniques, and improved precision of both the cataract and the vitreoretinal surgeon.

The Visual Acuity in our study was measured with the Snellen's chart among all the study patients. After nucleus drop, 30 (69.77%) patients had a visual acuity of HM-PR, while 10 (23.26%) patients had visual acuity of finger counting (FC), 2 (4.65%) patients had visual acuity in the range of 5/60 to 1/60 and only 1 (2.32%) had visual acuity of 6/18 to 6/60. VA was not recorded in 7 patients who underwent PPV in same sitting. After PPV we observed that the BCVA improved to the range of 6/6 to 6/18 in 30 (60%) patients after 6 months at the final follow up, 15 (30%) patients had a BCVA of < 6/18- 6/60, whereas only 5 (10%) patients had BCVA of <6/60. Salehi A et al (2011)<sup>31</sup> had reported the preoperative visual acuity before PPV to be 20/200 in 91.6% patients. None of their patients had visual acuity of 20/40 or better before PPV. The final visual acuity was observed to be 20 ± 50 in early PPV and 20 ± 200



in late PPV group (mean  $\pm$  SD,  $p < 0.001$ ).

Bose S et al (2017)<sup>27</sup> in their study had also observed the final best-corrected visual acuity (BCVA) to be 6/60 or better in majority of the patients who underwent PPV within 1 year of dislocation, but for patients who were delayed for over a year, the final BCVA was observed to be  $< 6/60$  ( $P = 0.001$ )

Another study by Ho LY et al (2009)<sup>32</sup> also showed 72.3% patients had a visual outcome of 20/40 or better and 10.8% of patients had a visual outcome of 20/200 or worse after PPV. In patients without any preoperative eye conditions, 82.6% achieved a final vision of 20/40 or better. Multivariable analysis in their study showed that predictors for visual outcomes of 20/40 or better were better presenting vision ( $P < 0.001$ ), insertion of a posterior chamber lens ( $P < 0.005$ ), and absence of preoperative eye disease ( $P < 0.001$ ).

## CONCLUSIONS

Our study concludes that dislocation of nucleus into the vitreous occurs more commonly after phacoemulsification and can have serious sequelae such as persistent inflammation, secondary glaucoma, corneal edema, and retinal detachment. Pseudoexfoliation, phacodonesis, floppy iris and myopia are some of the frequently associated risk factors for nucleus drop. Appropriate handling of such cases by both the cataract and vitreoretinal surgeons minimizes the patient's risk of serious complications like retinal detachment and results in good visual outcome. Pars Plana Vitrectomy is a safe and efficient surgical management of dropped lens fragment. The rise in intraocular pressure is seen in majority of the patients after nucleus drop and this reduces significantly when managed by pars plana vitrectomy. Majority of patients after nucleus drop can achieve best corrected visual acuity of 6/6 to 6/18 in the absence of any pre existing eye disease. Complications like fibrinous reaction, corneal edema and vitritis mostly resolve without leaving any sight threatening outcome.

## References

1. Leaming DV. Practice styles and preferences of ASCRS members—1994 survey. *J Cataract Refract Surg* 1995; 21: 378–85.
2. Pande M, Dabbs TR. Incidence of lens matter dislocation during phacoemulsification. *J Cataract Refract Surg* 1996; 22: 737–42.
3. Pingree MF, Crandall AS, Olson RJ. Cataract surgery complications in 1 year at an academic institution. *J Cataract Refract Surg*. 1999; 25: 705–708.
4. Aasuri MK, Kompella VB, Majji AB. Risk factors for and management of dropped nucleus during phacoemulsification. *J Cataract Refract Surg*. 2001; 27: 1428–1432.
5. Pande M, Dabbs TR. Incidence of lens matter dislocation during phacoemulsification. *J Cataract Refract Surg* 1996; 22: 737–42.
6. Smiddy WE, Flynn HW Jr. Managing retained lens fragments and dislocated posterior chamber IOLs after cataract surgery. *Focal Points. Clinical Module for Ophthalmologists. American Academy of Ophthalmology* 1996; Vol XIV, No. 7: 1–14
7. Blodi BA, Flynn HW, Jr., Blodi F, Folk JC, Daily MJ. Retained nuclei after cataract surgery. *Ophthalmology* 1992; 99: 41–44.
8. Lambrou FH Jr., Stewart MW. Management of dislocated lens fragments during phacoemulsification. *Ophthalmology* 1992; 99: 1260–62.
9. Gilliland GD, Hutton WL, Fuller DG. Retained intravitreal lens fragments after cataract surgery. *Ophthalmology* 1992; 9: 1263–67.
10. Irwine WD, Flynn HW, JR, Murray TG, Rubsamen PE. Retained lens fragments after phacoemulsification manifesting as marked intraocular inflammation with hypopyon. *Am J Ophthalmol* 1992; 114: 610–14.
11. Kim JE, Flynn HW, Jr., Smiddy WE, Murray TG, Rubsamen PE, Davis JL et al. Retained lens fragments after phacoemulsification. *Ophthalmology* 1994; 101: 1827–32.
12. Borne MJ, Tasman W, Regillo C, Malecha M, Sarin L. Outcome of vitrectomy for retained lens fragments. *Ophthalmology* 1996; 103: 971–76.
13. Kapusta MA, Chen JC, Lam WC. Outcomes of dropped nucleus during phacoemulsification. *Ophthalmology* 1996; 103: 1184–88.
14. Wong D, Briggs MC, Hickey-Dwyer MU, McGalliard JN. Removal of lens fragments from the vitreous cavity. *Eye* 1997; 11: 37–42.
15. Hutton WL, Snyder WB, Vaiser A. Management of surgically dislocated intravitreal lens fragments by pars planavitrectomy. *Ophthalmology* 1978; 85: 176–89.
16. Fastenberg DM, Schwartz PL, Shakin JL, Golub BM. Management of dislocated nuclear fragments after phacoemulsification. *Am J Ophthalmol* 1991; 112: 535–539.
17. Lambrou FH Jr, Stewart MW. Management of dislocated lens fragments after phacoemulsification. *Ophthalmology* 1992; 99: 1260–62.
18. Tommila P, Immonen I. Dislocated nuclear fragments after cataract surgery. *Eye* 1995; 9: 437–41.
19. Irvine SR, Irvine AR Jr. Lens-induced uveitis and glaucoma. *Am J Ophthalmol* 1952; 35: 177–186.
20. Epstein DL. Diagnosis and management of lens-induced glaucoma. *Ophthalmology* 1982; 89: 227–230.
21. Ross WH. Management of dislocated lens fragments following phacoemulsification surgery. *Can J Ophthalmol* 1993; 28: 163–66.
22. Smiddy WE, Flynn HW Jr, Kim JE. Retinal

- detachment in patients with retained lens fragments or dislocated posterior chamber intraocular lenses. *Ophthalmic Surg Lasers* 1996; 27: 856-61.
23. Peyman GA, Raichand M, Goldberg MF, et al. Management of subluxated and dislocated lenses with the vitrophage. *Br J Ophthalmol* 1979; 63: 771-78.
  24. Michels RG, Shacklett DE. Vitrectomy technique for removal of retained lens material. *Arch Ophthalmol* 1977; 95: 1767-73.
  25. Cohen SM, Davis A, Cukrowski C. Cystoid macular edema after pars planavitrectomy for retained lens fragments. *J Cataract Refract Surg* 2006; 32: 1521-26.
  26. Greven CM, Piccione K. Delayed visual loss after pars planavitrectomy for retained lens fragments. *Retina* 2004; 24: 363-67.
  27. Bose S, Gupta SK, Kishore P, Agrawal S, Katiyar V, Kumar P. Parsplanavitrectomy for dislocated crystalline/artificial intraocular lens: Factors predicting the visual outcome. *Egypt Retina J* 2017;4:43-5.
  28. Al-AmriAM. Visual Outcome of Pars Plana Vitrectomy for Retained LensFragments after Phacoemulsification. *Middle East Journal of Ophthalmology* 2008; 15(3-4): 107-11.
  29. Lai TYY, Kwok AKH, Yeung YS, Kwan KYW, Woo DCF, Yuen KSC, Loo AVP. Immediate pars planavitrectomy for dislocated intravitreal lens fragments during cataract surgery. *Eye* 2005; 19: 1157-62.
  30. von Lany H, Mahmood S, James CRH, Cole MD, Charles SJ, Foot B, Gouws P, Shaw S. Displacement of nuclear fragments into the vitreous complicating phacoemulsification surgery in the UK: clinical features, outcomes and management. *Br J Ophthalmol* 2008; 92: 493-95.
  31. Salehi A, Razmju H, Beni AN, BeniZN. Visual outcome of early and late pars planavitrectomy in patients with dropped nucleus during phacoemulsification. *J Res Med Sci* 2011; 16(11): 1422-29.
  32. Ho LY, Doft NH, Wang L, Bunker CH. Clinical predictors and outcomes of pars planavitrectomy for retained lens material after cataract extraction. *Am J*