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ORIGINAL RESEARCH

The Visual Outcomes After Pars Plana Vitrectomy for Dropped Lens Fragments in the National Eye Hospital of Vietnam

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Purpose: Evaluation of visual acuity results and analysis of influencing factors after vitrectomy surgery to treat complications of nuclear fragment fall at the Vietnam National Eye Hospital.

Patients and Methods: A cross-sectional study description of 35 patients (35 eyes) at Vietnam National Eye Hospital assessment of Visual acuity pre and post-pars plana vitrectomy, and some related factors.

Results: Patients had low visual acuity (VA) upon admission, with 82.9% (29/35 eyes) ranging from CF 1m to LP (+). At 3 months, VA mainly improved to levels 3 and 4, with only 3/35 eyes achieving better than 20/40. The primary factors influencing visual outcomes were anterior segment lesions, timely detection, and treatment to enhance postoperative vision.

Conclusion: After PPV, most patients showed some improvement, though changes in VA varied among individuals. Key factors affecting visual outcomes included anterior segment lesions, highlighting the importance of timely detection and treatment to improve postoperative vision.

Keywords: visual acuity, cataract complication, pars plana vitrectomy, Hanoi, Vietnam

Introduction

Pars plana vitrectomy (PPV) is an important intervention to treat the complication of nuclear fragment fallout, one of the serious complications after cataract surgery. If not treated promptly, this complication can cause severe vision loss, leading to blindness. In some studies worldwide, the success rate after PPV in cases of nuclear fragment fallout complications ranges from 75% to 85%. Still, this rate can vary depending on the patient's condition and intervention time.[1] In patients without endophthalmitis complications, the visual acuity (VA) improvement rate is significant, reaching 80% compared to 50% in the group with severe inflammation.[2]

Some important factors affecting the visual outcome after surgery include the time from the occurrence of complications to surgery, the extent of retinal damage, and the state of endophthalmitis. According to Dong (2024), patients with no history of previous retinal disease had a VA recovery rate of up to 75%, while those with retinal disease only achieved 50%.[3] Time is a key factor, as patients who underwent surgery within the first 7 days had a significantly better visual recovery than those treated late.[4] In Vietnam, research on factors affecting the results of PPV surgery in treating nuclear fragment complications has yet to focus on describing individual clinical cases without a comprehensive analysis of related factors. Therefore, this study was conducted to:

Evaluate visual outcomes and analyze influencing factors after pars plana vitrectomy surgery to treat nuclear fragment complications at the Vietnam Nation Eye Hospital.

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Subjects and Methods

Thirty-five patients were collected between January 2020 and March 2023. This study is a cross-sectional descriptive study combined with a retrospective analysis of medical records to evaluate VA outcomes and analyze related factors. Patients were measured with the best-corrected visual acuity using a Snellen electronic vision panel at a distance of 5m. Evaluation of the anterior segment, which consists of the cornea, anterior chamber, iris, pupil, and lens, will be done using CSO biomicroscopy model SL 990-5X-ELITE from Italy. Mydrin-P (Tropicamide 0.5% + Phenylephrine hydrochloride 0.5%) pupil dilation evaluates the posterior segment, including vitreous, optic spurs, and central retina—noted eye lesions. VA was measured using the Snellen visual acuity chart at preoperative, 1-day postoperative, and 3-month postoperative time points.

Inclusion Criteria

Those diagnosed with a fallen nuclear fragment complication, have undergone PPV surgery, and can follow up after surgery for at least 3 months at the Vietnam National Eye Hospital.

Exclusion Criteria

Patients with other severe eye diseases (such as retinal detachment, severe endophthalmitis, diabetic retinopathy) or who cannot be followed up fully within the required time will be excluded.

The Ethics Committee of Hanoi Medical University, Vietnam, and the National Eye Hospital granted ethical approval. All patients provided informed consent to participate in the study, and this study was conducted by the 1964 helsinki Declaration and its subsequent amendments or comparable ethical standards.

Data were entered into STATA software for descriptive statistical analysis.

Variables

VA assessment according to the 1993 World Health Organization classification: Level 1: Count finger (CF) 1m (0.02) >VA≥ Light perception (LP) (+), level 2: CF 3m (0.05) >VA≥ CF 1m (0.02); level 3; 2/10>VA≥ CF 3m (0.05); level 4: 5/10>VA ≥ 2/10; level 5: VA ≥ 5/10.[5] Other factors such as time from complication to surgery, intraocular pressure (IOP), corneal edema, previous corneal sutures, uveitis, vitreous extravasation, nuclear fragment location, retinal damage, and surgical methods performed were also collected from the medical records.

Result

Table 1 shows the mean age was 69.77 ± 14.51, female 57.14%. The time of surgery after admission was 3.09 ± 1.27 days; the mean IOP was 19.71 ± 6.46 mmHg. 91.43% of patients had corneal edema, and 48.57% had previous corneal sutures. Iris damage was 45.72%, and pupil damage was 68.57%. 54.28% had vitreous escape into the anterior chamber, and 40% had nuclear fragments in the vitreous chamber. Retinal damage was present in 25.71% of patients. The main surgical methods were phacoemulsification combined with vitrectomy (28.57%) and vitrectomy (25.71%). The table shows the diversity in lesions and treatment methods.

Figure 1 shows that most patients had grade 1 VA on admission and did not show significant improvement on the day after surgery, as many patients maintained the same level of VA. Only a small number of patients improved to grade 2 or higher.

Figure 2 shows a trend in visual improvement, with some cases increasing from grade 1 to grade 2 while others show greater improvement up to grade 4. However, some variability also indicates that VA change is not uniform across patients. The chart reflects a trend in VA improvement after surgery, but the degree of improvement varies from patient to patient.

Figure 3 shows visual acuity at all stages before and after surgery. The postoperative VA results were mainly at level 1 because the lesions, such as corneal edema, pupillary damage, iris damage, and vitreous opacification, had not fully recovered, combined with vitrectomy to treat the nuclear fragment. At the time of re-examination, the VA was mainly in groups 3 and 4, with only 3/35 eyes achieving VA >20/40. The VA of most patients tended to improve, with some

Table 1 Characteristics of Study Subjects

Variables	Number	Values
Age	35	69.77 ± 14.51
Gender		
Male	15	42.86
Female	20	57.14
Time to hospital after complications		
During the day	4	11.43
From 2 to 7 days	21	60
From 8 to 60 days	10	28.57
Surgery time after admission	35	3.09 ± 1.27
Intraocular pressure preoperative	35	19.71 ± 6.46
Corneal edema		
Yes	32	91.43
No	3	8.57
Previously sutured cornea		
Yes	17	48.57
No	18	51.43
Iris damage		
No	19	54.28
Yes	16	45.72
Pupillary damage		
Yes	24	68.57
No	11	31.43
Vitreous into anterior chamber		
Yes	19	54.28
No	16	45.72
Location of nuclear fragments		
Anterior chamber	7	20
In the capsular bag	6	17.14
In the vitreous chamber	14	40
All locations	8	22.86
Retinal tear		
Yes	9	25.71
No	26	74.29
Surgical methods		
PPV + phacofragmatome	10	28.57
PPV + IOL fixation scleral	6	17.14
PPV + IOL in the sulcus	8	22.86
PPV	9	25.71
PPV + laser + retinopexy	2	5.71

increasing from level 1 to level 2 and some improving more to level 4. However, there was still some variation, indicating that the VA changes varied among patients. The overall graph reflects the trend of improved VA after surgery, but the degree of improvement was uneven.

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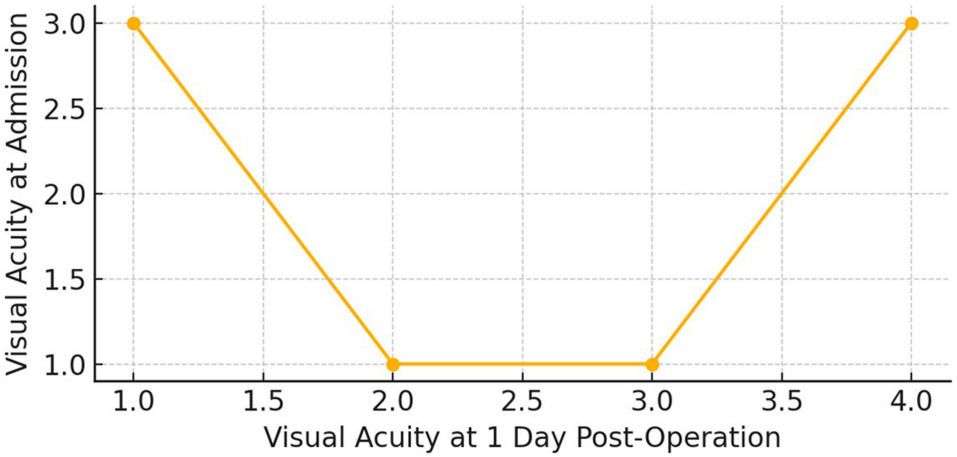

Figure 1 Visual Acuity at 1 day Post-Operation.

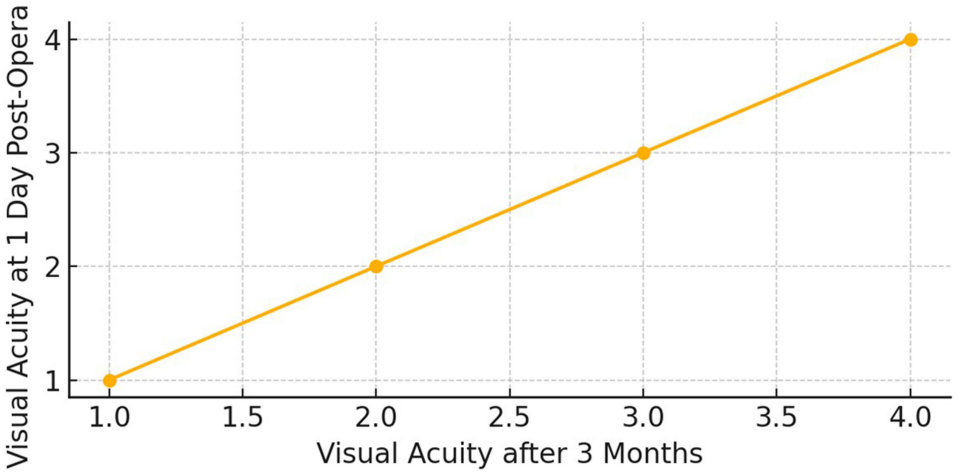

Figure 2 Visual Acuity after 3 months.

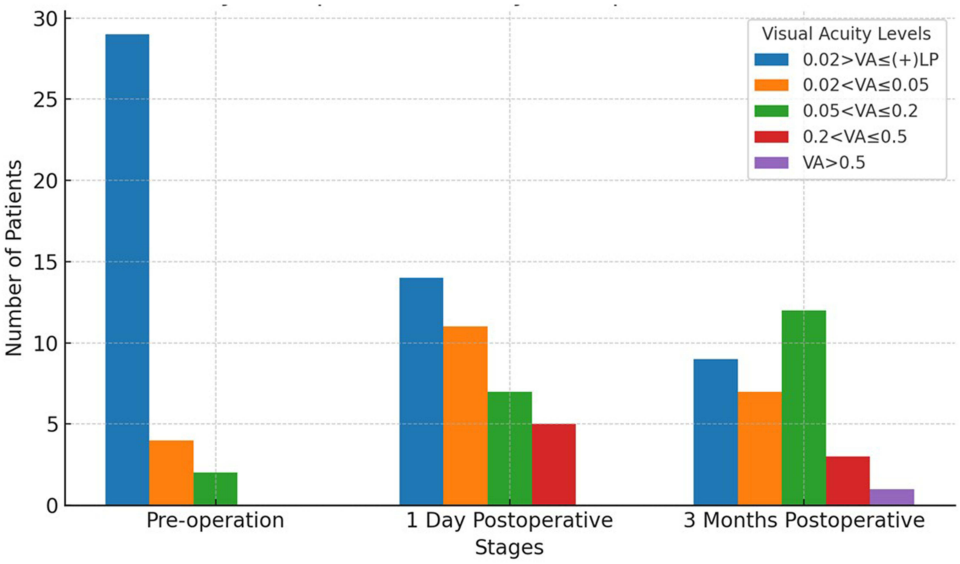

Figure 3 Visual acuity pre-post Operation 1 day and 3 months.

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Discussion

Characteristics of the Subjects

Through the study of 35 patients, we found that the average age was 69.77. Analysis by age group showed that most patients were in the 60–70 age group because, at this age, the lens has begun to harden, making it easy to have complications during surgery. In previous studies, surgical patients were younger, possibly due to social knowledge and the need for earlier health care.[6]

The time patients arrived at the hospital after surgical complications was also an important factor.[7] Patients who arrived early often had dramatic clinical symptoms such as conjunctival congestion, corneal edema, anterior chamber hemorrhage, or severe pain and vision loss due to displaced lens fragments. In contrast, those who arrived late often had silent symptoms, which only became apparent when complications progressed, such as uveitis or glaucoma. In the study, ten patients presented late, some after 2 months. Symptoms worsen as the nuclear fragment increases in size and causes inflammation. We recommend that patients seek medical attention early after complications to avoid improper treatment that worsens complications.

There are two views on the timing of vitrectomy in treating retained nuclear material. Supporters of late intervention believe that delaying vitrectomy helps soften the nucleus, better control inflammation and IOP, and reduce the risk of choroidal detachment.[8] In contrast, early vitrectomy has been shown to reduce the risk of glaucoma, retinal detachment, and macular edema.[9] In our study, 25 were removed early, and 10 were removed late. Late PPV is appropriate when medical treatment fails, with the advantage of better control of IOP and inflammation. Early PPV is often indicated for large nuclear masses that are at high risk of not responding to medical treatment.

In our study, nine eyes had high IOP, including three eyes with pseudoexfoliation syndrome and six eyes due to phaco surgery complications. Pseudoexfoliation is often accompanied by high IOP and requires careful preoperative evaluation. Patients with high IOP due to phaco complications usually have pupillary and anterior chamber obstruction due to anterior displacement of the vitreous, unlike previous studies caused by uveitis.[2,10] Early PPV was performed to resolve the vitreous mass causing obstruction, eliminating the risk of corneal endothelial decompensation and glaucoma due to angle obstruction. Common anterior segment lesions in eyes with nuclear material retained after phaco surgery include iris damage, corneal edema (27.2%), and hyphema (12.6%). Corneal edema is often caused by compression of the vitreous or nuclear fragments. Pupillary lesions include pupillary dilation and tearing. The anterior segment lesions in our study group were more frequent and severe than those in other studies. The reason may be that Vietnamese patients often have cataracts in the late stages, accompanied by corneal diseases such as scarring, entropion, and neovascularization. In addition, due to a lack of equipment and experience, phaco surgeons did not perform vitrectomy in the anterior chamber, increasing the risk of complications. Attempting to treat nuclear fragments and vitreous in the anterior chamber without using a vitrectomy machine also caused more severe corneal and iris injuries.

The most common posterior segment injuries were vitreous hemorrhage (3/35 eyes) and retinal tears (2/35 eyes), many of which were only detected during surgery. Combined vitrectomy and surgery is the optimal solution to prevent vitreous-retinal proliferative and detect retinal tears.[7,8,10] In the study, vitreous hemorrhage was the most common posterior segment injury (3/35 eyes) related to anterior chamber hemorrhage and lens dislocation. Vitreous hemorrhage can be caused by damage to the ciliary body, retina, or blood communication between the anterior and posterior segments, causing vitreous-retinal hyperplasia. Retinal tears (2/35 eyes) are common but usually only detected during surgery. This study suggests that pars plana vitrectomy effectively detects and treats retinal tears.

During vitrectomy for residual nuclear material, we used the This effectively treats hard nuclear fragments that the vitrectomy tip could not completely remove. The fragmatome tip should only use phaco energy when fragmenting the nucleus in the vitreous chamber to limit the impact on the retina. Perfluorocarbon liquid can be helpful in cases where the nuclear fragment is located in the posterior retina or there is retinal pathology, making the process of nuclear fragment removal and retinal tear treatment more convenient.[11] However, in normal cases, the surgeon can handle it without using perfluorocarbon liquid.

Visual Acuity Before and After Surgery

Most patients came to the hospital with severe visual function (29 patients had VA at level 1, 2 patients with level 2, 4 patients with level 3). The cause of visual impairment is a combination of many anterior segment lesions with high rates and severity. When studying nuclear prolapse in the vitreous chamber, many authors have emphasized the prognosis of VA after surgery based on the level of input VA.[2,7,9,10] When evaluating the results, the authors identified age and VA as factors affecting the treatment results.

In our study, the VA results after long-term follow-up were limited: Only 3/35 eyes had VA results of 20/40 or better, mainly in group 3 (0.2 > VA > 0.05) and group 4 (0.5 > VA > 0.2). There are many reasons to explain this. One is that the vitreous and anterior chamber nuclei are not completely treated when arriving at the hospital. The patient is transferred to the hospital when the phaco surgeons have tried everything to save him but failed, so they will transfer him to a higher level. Due to the lack of equipment, the phaco surgeon does not cut the anterior chamber vitreously, removes all the cortex in the capsular bag, and still tries to place the IOL in the ciliary body fissure. The mixed lesion, including the anterior chamber vitreous, the remaining cortex in the capsular bag, and the IOL not firmly positioned in the capsular bag, makes it very difficult for the vitrectomy surgeon to handle complications. The second is that the combined anterior segment lesions cause vision loss. There are 17 eyes with iris damage and 25 eyes with pupil damage. The above manifestations affect vision and cause discomfort in the patient's quality of vision (glare, glare, halos). Another indispensable cause is post-operative refractive disorders. Refractive errors have many causes, such as astigmatism due to corneal sutures, position, and power of artificial IOL. To investigate this cause requires further research on another topic.

Conclusions

In our study, the VA of patients upon admission was low, with 82.9% (29/35 eyes) of patients having VA from CF 1m to LP (+). After PPV to treat complications of nuclear fragment fall, 42.86% of eyes achieved VA of 20/100 or better, of which three eyes achieved VA above 20/40. The main factors affecting visual outcomes include anterior segment lesions. Timely detection and treatment of these lesions are important in improving visual outcomes after surgery.

Abbreviations

VA, visual acuity; IOP, intraocular pressure; PPV, pars plana vitrectomy; CF, count finger; LP, light perception; IOL, intraocular lens.

Data Sharing Statement

The data supporting this study's findings are available from the corresponding author upon reasonable request. If you have concerns about sharing the data, please contact nguyenletrungb4@vmmu.edu.vn.

Ethical Statements

All participants were dispensed with written informed consent, and the protocol was approved by the Ethical Review Committee of the Hanoi Medical University and Vietnam Eye National Hospital. All patients provided written informed consent, and this study was conducted following the 1964 helsinki Declaration and its later amendments or comparable ethical standards.

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