

Dropped Nucleus-When Does it Happen and what should be Done-A Review in one Center

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ABSTRACT

AIM: A dropped nucleus is a nightmare for any cataract surgeon but as in all surgeries, complications are unavoidable. What is important is to recognize the occurrence of complications and to identify the causes and take measures to prevent them in future. We recently had a rise in dropped nuclei occurring in our center. This study was done to identify causes and associations of dropped nuclei in order to improve patients' outcomes.

MATERIALS AND METHODS: Retrospective analysis of dropped nucleus from June 2014 to January 2015 was done. Types of cataract, ocular and systemic comorbidities, point of occurrence of dropped

nuclei, subsequent complications and management and final visual outcome were noted.

RESULTS: Eight dropped nuclei occurred during various stages of cataract surgery contributing 0.6% of total cataract operations. Not stopping phaco once a posterior capsule rupture (PCR) occurred, lead to dropped nucleus. Pars plana vitrectomy (PPV) was delayed or not done –leading to rise in intraocular pressure with resultant punctate epithelial erosions and retinal detachment and poor visual outcomes.
CONCLUSION: PCR must be recognized and appropriate steps taken to prevent a nucleus from dropping. Once a nucleus has dropped, early PPV should be done to prevent further complications that lead to poor vision.

Key words: Dropped nucleus; Point of occurrence; Outcomes

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INTRODUCTION

Cataract is a leading cause of blindness in Malaysia (39%)^[1]. A dropped nucleus is a nightmare for any cataract surgeon. First a posterior capsule rupture occurs, and if not recognised and managed appropriately, can lead to a dropped nucleus which can then lead to a series of other complications such as raised intraocular pressure, corneal decompensation, cystoid macula oedema and retinal detachment which compromise vision.

Melaka Hospital is a state hospital serving a population of 821, 110^[2]. Cataract surgeries are done by Specialists, Gazetting Specialists (Specialists who have passed postgraduate exams but are still under supervision) and Medical Officers. Due to a recent increase in dropped nuclei occurring during cataract surgery, this study was undertaken to study factors causing and associated with dropped nuclei in order to minimize the occurrence in future. A study on point of occurrence of posterior capsule rupture has been conducted in the hospital^[3].

MATERIALS AND METHODS

A retrospective analysis of dropped nuclei from June 2014 to January 2015 was done. Type of cataract, grade of surgeon operating, presenting visual acuity, systemic and ocular comorbidities were noted from the case notes. The technique of phacoemulsification, point of

occurrence of dropped nucleus and the further management once it occurred were studied. Subsequent surgeries done and all postoperative complications were noted. Final best corrected visual acuities were recorded once they were stable and no further intervention was required. The best corrected visual acuities were based on refractions done by hospital Optometrists.

Table 1 Descriptive statistics of basic variables among patients undergoing cataract operation, Hospital Melaka, June 2014 to January 2015.

Variables	Values
Age (Mean + Standard Deviation)	65.8 + 9.3
Gender	
Female	644 (53.7)
Male	554 (46.2)
Ethnicity	
Chinese	397 (33.1)
Indian	124 (10.3)
Malay	616 (51.3)
Other	9 (0.7)
Total	1199 (100.0)

Table 2 Types of cataract operation complications, Hospital Melaka, June 2014 to January 2015.

Variables	Values No (%)
Types of cataract operation complications	
Posterior capsule rupture	36 (3.0%)
Vitreous loss	17 (1.4%)
Zonular dehiscence	9 (0.7%)
Dropped nucleus	8 (0.6%)
Other intra-operative complications	4 (0.3%)
No intra-operative complication	1149 (95.8%)
Total	1199 (100.0)

Table 3 Characteristics, management details and visual outcomes of dropped nuclei cases.

Demographic Features	Type of cataract Preoperative Vision	Status of Surgeon	Stage Nucleus Dropped	Management	Visual Outcome
66/Ch/F	NS2 PSC, 6/60	Spec	After 1st piece removed. 3/4 piece dropped.	PPV+anterior vitrectomy+nucleus removal+sulcus PCIOL placed after 2 weeks	+1.50/-3.75x60 '6/18. N10@30cm. Few PEE. Mild NPDR after 1 year.
71/Ch/F	NS2 PSC, 6/18	Spec	After 1st piece removed. 3/4 piece dropped.	Sulcus IOL placed in same sitting. Topical glaucoma drugs for raised IOP. PPV+anterior vitrectomy after 12 days.	-1.50/-0.50x170 6/60. N60@30cm. PEE. CMO.
55/Mal/M	White Cataract, HM	Spec	During last segment removal. 1/4 piece dropped.	Raised IOP for 4 months, controlled with systemic and topical glaucoma drugs. Small nucleus still persisted 4 months later. Patient then defaulted.	-1.00/-1.25x100 6/36. N36@30cm.
68/Ch/F	NS1 PSC, 6/36	MO	PC rent noticed during 2nd segment removal. Phaco continued. 1/8th piece dropped.	Sulcus IOL placed in same sitting. Raised IOP after 1 week-controlled with systemic and topical glaucoma drugs. Diagnosed as steroid responder at 14 weeks postoperatively with IOP 30mmHg. Topical steroids taken off and topical glaucoma medications maintained. IOP controlled at 16 weeks postoperatively but PEEs and AC cells persisted. At 6 months postoperatively, epinucleus was seen inferiorly on the retina and a small tear. Was located inferotemporally with a shallow RD. The tear was lasered but the uptake was poor due to SRF. PPV+EL+SRF drainage+ILM peel+C3F8 injection were done a week later. A retinal tear with operculum was detected and lasered intraoperatively.	HM. Cornea hazy. PEE. Retina flat.
68/Mal/M	NS2 PSC, 6/18	Spec	After 3rd piece removed.	Raised IOP controlled with oral and topical glaucoma drugs. PPV+lens fragmentation+ACIOL+ PI after 1 week	Plano 6.75. +3.00 DS N6
74/In/F	CF 1 foot	Spec	PC rent noticed during last segment removal. 1/4 piece dropped.	Anterior vitrectomy+ ACIOL placed in the same sitting. Raised IOP treated with topical glaucoma drugs. Folded PC, cortical matter and vitreous were seen in AC.	6/60. PEE. Hazy fundus view.
66/Ch/F	NS2 PSC, 6/60	Spec	PC rent noticed after 2nd piece removed. Phaco continued. Last piece dropped.	PPV+lens fragment removal+sulcus IOL placed 1 week later.	+0.50/-1.50x90 6/6. +1.00 DS N5@30cm
61/Ch/F	NS2 PSC, 6/24	Spec	PC rent noticed during sculpting. Phaco continued. Epinucleus dropped.	Sulcus PCIOL placed in the same sitting. Raised IOP treated with topical glaucoma medications. PPV+epinucleus removal+cryotherapy done after 10 days. Multiple small retinal tears were found.	PI/-0.50x100 6/6. +2.50 DS N5@30cm

Spec-Specialist, MO-Medical officer.

RESULTS

As noted in Table 1, there were a total of 1199 patients that were admitted and operated upon for cataract surgeries in Hospital Melaka between June 2014 and January 2015.

The mean age of these patients was 65.8 years of age (Table 1). The patients comprised of 53.7% females and 46.2% males (Table 1). The main ethnic groups that were operated upon comprised of the Malays (51.3%) followed by Chinese (33.1%) and the Indians (10.3%).

There was no intra-operative complication in 95.8% of the 1199 cataract operations between June 2014 and January 2015.

Among 50 cataract operation complications, posterior capsule rupture was the commonest complication recording 3.0% of the total cataract operations, followed by vitreous loss (1.4% of total cataract operations), zonular dehiscence (0.7%), dropped nucleus (0.6%) and other intra-operative complications (0.3%) as shown in Table 2.

Nuclei dropped at various stages of phaco, mostly in the hands of Specialists as shown in Table 3. None were dense cataracts. Although 5 patients had Hypertension, none had raised blood pressure intra-operatively. There were 3 Diabetics. None had ocular comorbidities such as high myopia, pseudoexfoliation, or previous vitrectomy, which are associations of intraocular complications.

In some, Posterior capsule rents were recognized but phaco was continued and the nuclei dropped. A number of patients had a rise in intraocular pressure (IOP) prior to Pars Plana Vitrectomy (PPV) requiring glaucoma medications. Raised IOP persisted in those who did not have PPV. Good visual outcomes were seen in those who had early PPV.

Delaying or not doing a PPV resulted in poorer outcomes due to Punctate Epithelial Erosions (PEEs), Cystoid Macula Oedema (CMO) and Retinal Detachment (RD).

DISCUSSION

There were a total of 1199 patients who were admitted and operated upon for cataract surgeries in Hospital Melaka between June 2014 and January 2015 with dropped nucleus complications contributing 0.6% of total cataract operations.

Most dropped nuclei occurred in the hands of Specialists who were still learning phaco. Aasuri *et al*^[4] (2001) found dropped nucleus occurring more among less experience surgeons ($p = 0.007$). Majority were Nuclear Sclerosis (NS2) with Posterior Subcapsular cataract (PSC). Ocular comorbidities such as polar cataracts, pseudoexfoliation and subluxated lenses and systemic rise of blood pressure did not contribute to the dropped nuclei.

Nuclei dropped at various stages of phacoemulsification done by divide and conquer technique. We could not find literature on the point of occurrence of dropped nucleus.

In one case, posterior capsule rent (PCR) was recognized after first segment removal, but continuation of phaco resulted in a dropped nucleus. Here phacoemulsification should have been stopped and manual extraction of nucleus should have been done. In other cases, the occurrence of PCR was not recognized by the surgeon. The surgeon should have a high index of suspicion of a PCR and learn to recognize the signs early. These signs are visible linear lines, visible vitreous, sudden deepening of anterior chamber, tilting of the nucleus, brightening of the fundus glow or the pupil snap sign.

Although most complications occurred in the hands of Specialists, they were fairly junior. We were unable to pin point the exact reasons for the dropped nuclei to happen. No case was reported to have a hard cataract or small pupil or pseudoexfoliation which are all risk factors

for intraoperative complications. In some cases the surgeon was very confident and had continued phaco, but unfortunately it resulted in the nucleus dropping. We propose that all cases be videotaped and recordings be viewed later to pin point the problem to avoid this from occurring in future. It is also advisable for surgeons with dropped nuclei to have a more competent surgeon to observe and try to help the surgeon to rectify the mistakes, which will then benefit patients' outcomes.

There was a delay in performing or not doing PPV which resulted in raised IOP and even RD occurring and compromising vision. Studies showed that early PPV was advantageous as there was less rise in IOP^[5-8], less inflammation and less risk of RD and to restore good outcome. Tajunisah *et al*^[9] found no difference in visual outcomes between early and late vitrectomy, but all patients in their series had vitrectomy within 2 months.

Surgeons should be able to take measures by recognizing and taking appropriate measures including early PPV as soon as PCR has occurred to obtain good visual outcomes and preventing the complications of dropped nucleus. We recommend vitreo retinal surgeons be placed in all General Hospitals and all cases undergo PPV with retrieval of the nucleus soon to prevent further complications associated with it.

Future studies should be done to analyse details of intraoperative complications as a whole at the hospital and noting the situations at which all forms of PCR and dropped nuclei occurred.

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