Original Research Article

Intra-Operative Phacoemulsification Conversion to Extracapsular Cataract Extraction: Risk Factors and Visual Outcome

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Abstract

Phacoemulsification (PEA) is currently the procedure of choice for most cataract extraction. However, intra-operative complications may require the procedure to be converted to extracapsular cataract extraction (ECCE). We have evaluated the indications for conversion and visual outcomes in cases converted from phacoemulsification to ECCE. A retrospective review was performed on 33 eyes in which phacoemulsification was initiated and then converted to ECCE. The main parameters evaluated were indications for conversion and visual outcomes at 3 months. Thirty-three cases out of 1448 operations were identified from January 2013 to February 2014.The incidence of PEA converted to ECCE was 2.2%. The indications for ECCE conversion were posterior capsular rupture (PCR) in twenty-two cases, combined capsulorhexis extension with PCR in three cases, capsulorhexis extension and zonular dialysis in two cases respectively. Combined zonular dialysis with PCR, corneal toxicity, Descemet's tear and obscured edge of capsulorhexis had one case each. Twenty-six (78%) cases had gain in vision, one (3%) case had unchanged vision and six (18%) cases had worsening of vision. The incidence of complicated phacoemulsification surgery requiring intra-operative conversion to ECCE was low in our study (2.2%). Seventy-eight percent of cases achieved final VA of 6/12 or better. Therefore, early recognition of complications and timely intra-operative conversion of PEA to ECCE may result in good visual outcome.

Keywords: Cataract extraction, intraocular lens, phacoemulsification, posterior capsular rupture, visual acuity

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Date of submission: 31 Jul, 2017 Date of acceptance: 8 Sept, 2017

Introduction

Cataract is the most important cause of preventable blindness all over the world and cataract surgery forms the major workload of the ophthalmology unit (1). Phacoemulsification (PEA), in which an ultrasound probe emulsifies the cataractous lens through a small 3-mm incision, has become the method of choice in the past decade taking over the conventional extracapsular cataract extraction (ECCE), which involves removing the lens nucleus through a 12-mm incision (2).

The increasingly advanced PEA technology offers a safe disassembly and aspiration of lens and rapid recovery of patients post-operatively (3). However intra-operative complications may occur and requires the procedure to be converted to ECCE. Some of the intra-operative complications of PEA includes posterior capsule tears (PCR) with or without vitreous loss, capsulorhexis extension, zonular dialysis and endothelial trauma (4).

A study done by Dada et al., at their centre showed the rate of conversion at their centre was 3.2% with common risk factor for the conversion was due to pupillary miosis and PCR (3). While study done by Mercieca Karl et al., reported common risk for intraoperative conversion in their centre was due to dense nucleus and capsulorhexis extension (5). There

https://doi.org/10.17576/JSA.2017.0702.03

are only few studies reported on the outcome of conversion of PEA to ECCE by looking at the risk factors.

Thus, surgeons should be aware of the factors that require PEA conversion to ECCE and be ready to convert if required intra-operatively. We are reporting a retrospective analysis at our centre evaluating the rate of conversion of PEA to ECCE, common indications for conversion and its final visual outcome at 3 months.

Materials and Methods

A total number of 1448 cases of cataract surgeries were performed in our centre, Department of Ophthalmology, Universiti Kebangsaan Malaysia Medical Centre, a major tertiary referral and postgraduate training centre in Kuala Lumpur from January 2013 to February 2014. The medical records of 33 patients who were converted to ECCE intra operatively were evaluated retrospectively. All cases that required conversion from PEA to ECCE were included. The pre-operative assessment documentation included a slit lamp biomicroscopy examination to evaluate anterior segment and posterior segment of the eye, amplitude scan biometry and corneal topography. All the 33 cases were initially planned for PEA with intraocular lens implantation. Pre-operatively, two patients had underlying epiretinal membrane and were not keen for vitrectomy with epiretinal membrane peel.

Initiation of PEA was via a clear corneal incision approach. PEA would be converted to ECCE after encountering any intra operative difficulties or complications. Post-operatively these patients were followed up at one week, one month and three months at our clinic with best corrected visual acuity (BCVA).

Results

Total number of PEA cases performed from January 2013 to February 2014 was 1448 cases. Thirty-three cases required intra-operative conversion from PEA to ECCE. There were eighteen males and fifteen female patients that required conversion. Thus incidence for conversion was 2.2%.

Mean age of patients that underwent PEA converted to ECCE was 69.3 years old (54-84 years). Twelve cases (36%) had dense cataract where seven cases had posterior subcapsular cataract grade three or worse, two cases had nuclear sclerosis grade three or worse and three cases had mature cataract. Duration of cataract surgery requiring conversion in average took about 45 min to 75 mins to complete.

Table 1: Risk factors for PEA conversion to ECCE (N=33)

Causes for PEA conversion to ECCE	Number of cases	(%)
Posterior capsular rupture	22	66
Combined extended capsulorhexis with posterior capsular rupture	3	9
Extended capsulorhexis	2	6
Zonular dialysis	2	6
Combined zonular dialysis with posterior capsular rupture	1	3
Corneal toxicity	1	3
Descemet's tear	1	3
Obscured edge of capsulorhexis	1	3

Posterior capsular rupture (PCR) was the commonest cause with 22 cases requiring intra-operative conversion to ECCE. This is followed by combined extended capsulorhexis with PCR which had 3 cases that needed PEA to be converted to ECCE. Zonular dialysis and extended capsulorhexis each had 2 cases respectively as a risk factor for conversion. Combined zonular dialysis with PCR, corneal toxicity, Descemet's tear and obscured edge of capsulorhexis by milky white material all had one case respectively (Table 1).

In our study, PCR was found to happen commonly either during the last segment removal or while sculpting with 13 and 9 cases respectively. We also noted that PCR also occurred during sculpting of nucleus in the 3 patients that required intraoperative conversion to ECCE due to combined zonular dialysis with PCR.

Three-month post-operatively, 26 patients had gained in vision, six had worsening of vision and one had unchanged vision compared to their pre-operative vision. From the data above, twenty-two cases (67%) had BCVA of 6/12 or better and seven out of these cases (21%) had good BCVA of 6/6. Four cases (12%) had BCVA of 6/36 or worse and seven cases (21%) had BCVA between 6/18 & 6/24 (Fig. 1).

Five patients had worsening of vision three-month post-operatively due to post-operative complications. One patient with no underlying ocular co morbid unfortunately developed retinal detachment with macula off one week post-operatively and underwent pars plana vitrectomy and the final BCVA was perception of light (PL). Another patient developed secondary glaucoma with bullous keratopathy and had a BCVA of hand movement (HM). One patient was left aphakic due to intra operative cornea haziness whose BCVA was 6/24 and was planned for secondary intraocular implantation once cornea is clear. While

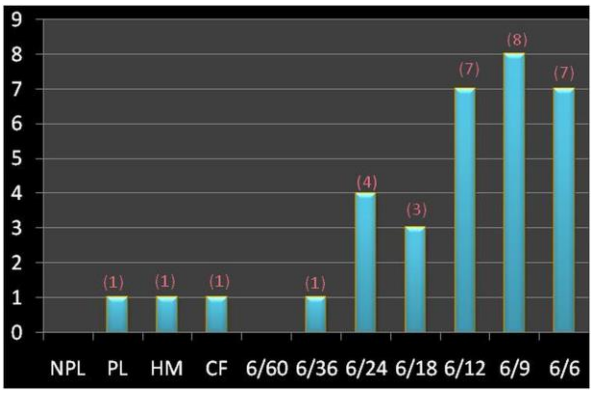

Figure 1: Best corrected visual acuity at three months post operatively (NPL: No perception of light, PL: Perception of light, HM: Hand motion, CF: Counting fingers)

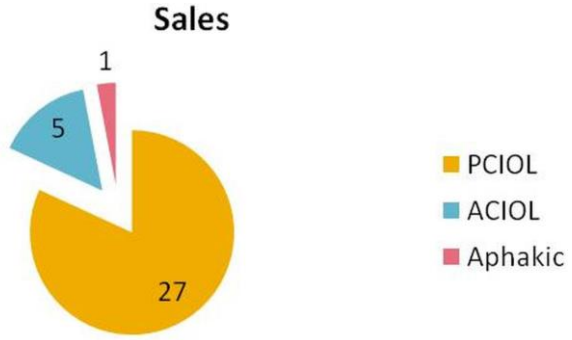

Figure 2: Type of intraocular lens implanted (PCIOL: Posterior chamber intraocular lens, ACIOL: Anterior chamber intraocular lens)

another patient developed posterior capsular opacity three-month post-operatively and refused for yag capsulotomy thus the BCVA remained as 6/24. While another patient who had worsening of vision post operatively was due to worsening of epiretinal membrane with final BCVA of counting finger (CF).

In those eyes that had the PEA conversion to ECCE, 27 patients had posterior chamber intraocular lens (PCIOL) implanted. Among the patients with PCIOL, 16 patients had the lens implanted in the sulcus while 11 of them had the lens implanted in the bag. Five patients had anterior chamber lens implanted due to zonular dialysis and posterior capsular tear, while 1 patient with hazy cornea intra-operatively remained aphakic and was planned for secondary IOL implantation later once the cornea is clearer (Fig. 2).

There were also three cases who sustained dropped nucleus intra-operatively requiring pars plana vitrectomy, however final BCVA 3 months post-operatively was 6/12 and better. Two other cases that developed cystoid macula edema post-operatively requiring intravitreal ranibizumab with had final BCVA of 6/12 at 3 months post-operatively.

Discussion

Despite PEA being the most commonly performed surgery with good success rate, there may be intra-operative complications that require PEA to be converted to ECCE. Thus, we have studied the incidence, risk factors and final visual outcome of the cases that requires intraoperative PEA conversion to ECCE.

Posterior capsular rupture with or without vitreous loss is the commonest intra-operative complication during cataract surgery (6). Similarly, in our centre the major complication of PEA was PCR. Early identification of signs of PCR such as unusually deep anterior chamber, sudden difficulty in rotation of the previously mobile nucleus, excessive tipping of one pole of the nucleus, lateral mobility or loss of nucleus follow ability and partial descent of nucleus into anterior vitreous is important (7). If the tear is small, it can be converted into a posterior capsulorhexis and a sheets glide can be introduced over the tear and PEA can be continued in careful manner (8). However, if the tear is large it is best to convert to ECCE to minimize the risk of nucleus drop and unnecessary manipulation within the anterior chamber might compromise the cornea and potentially lead to more disastrous complications such as suprachoroidal haemorrhage due to excessive manipulation within the eye.

PEA surgery in a case of zonular dialysis can be rather challenging. If the zonular dialysis is small with soft and stable lens especially in young patients, PEA can be done by soft aspiration (9). Usage of abundant dispersive viscoelastic is also important in case of zonular dialysis to prevent anterior prolapse of vitreous. In case pre operatively a zonular dialysis is detected, capsular tension ring can be used to stabilize the capsular bag and prevent vitreous prolapsed (9, 10). However, a zonular dialysis larger than three clock hours, presence of brunescent cataract with zonular dialysis and if the integrity of the remaining zonules is compromised it is safer to remove the nucleus via ECCE (10). The signs of zonular dialysis are irregular depth of anterior chamber, position of nucleus at a greater depth, difficult rotation of nucleus, appearance of red glow at the quadrant location of dialysis and visualization of capsular bag margin (8).

Capsulorhexis is an important entry step in PEA. Extended capsulorhexis may occur especially with sharp instrument, excessive traction during capsulorhexis or while nucleus rotation, chopping or cracking. The high volume irrigating fluid entering the eye during PEA can tear extended capsulorhexis up to

https://doi.org/10.17576/JSA.2017.0702.03

the posterior capsule and lead to drop nucleus and vitreous loss (3). Thus, if extended capsulorhexis is detected early, the anterior chamber should be first stabilized with viscoelastics before removing the ultrasound probe. The nucleus removal can be done by slow-motion phacoemulsification with lowered parameters. Chopping technique is also recommended at this stage with no excessive nucleus manipulation (11). If the capsulorhexis extends posteriorly a good option is to convert PEA to ECCE to prevent complication like vitreous loss and dropped nucleus (8).

Cornea toxicity and descemet tear are rare intra operative complication which may lead to hazy cornea thus resulting in poor view during PEA. Thus conversion to ECCE is important to prevent complications such as posterior capsular rupture with nucleus drop and zonular dialysis. Cornea toxicity in our case possibly is due to the use of povidone while cleaning the patient's eye or injection of vision blue or balanced salt solution that resulted in a sterile inflammatory reaction resulting in cornea edema. Most patients have good visual outcome post cornea toxicity especially after the start of steroid however small number may persist (12). The presence of a large and centrally placed descemet tear maybe also cause of obstructed view during PEA thus converting to ECCE will be a better option for cataract removal.

Conclusion

In our study, a good percentage of final visual outcomes were seen in the cases that required conversion from PEA to ECCE intra-operatively. A total of 22 out of the 33 cases that underwent conversion had a good final visual outcome of 6/12. The good visual outcome among the cases that required conversion shows that if in case of any difficulty intra operatively it is best to convert to ECCE without any hesitance to ensure no further complications is done to the patient as well as to provide a good final vision. However, the limitation that we encountered in this study is that, we are unable to standardize the pre and post-operative data collection that may have helped in analyzing other risk factors that may be associated with intra-operative conversion. We were also unable to control the outcome assessment as we rely on the previous record keeping. Therefore, from our study we believe that early recognition and good management of intra-operative complications results in a good visual outcome.

Acknowledgement

The authors thank Mr. Hairul Nizam Harun for image editing.

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