
COMPARATIVE STUDY OF POSTERIOR RENT IN CASES OF ROUTINE EXTRACAPSULAR, SMALL INCISION NON PHACO AND PHACOEMULSIFICATION

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INTRODUCTION

It is helpful to know at what step of the cataract surgery the disruption of posterior capsule occurred, whether it was associated with vitreous loss, how it was managed, and if it precluded posterior chamber lens implantation. Occurrence of this complication can render PCIOL insertion difficult, if not impossible. Management of vitreous loss is different when we compare various surgical techniques (routine extra capsular cataract surgery, small incision cataract surgery and phacoemulsification). The potential importance of vitreous loss and the significance of correct management cannot be overemphasised. When properly managed, a torn posterior capsule is compatible with an excellent visual outcome.

The overall incidence of posterior capsular / zonular disruption is a function of an individual surgeon's innate and acquired skills.

OBJECTIVE

To study the causes of posterior capsular rent in various surgical techniques (routine extra capsular cataract surgery, small incision cataract surgery and phaco emulsification) and know the circumstances under which posterior capsular (PC) rent occur.

MATERIALS AND METHODS

We observed total 1820 cases operated in our institute. Out of these we selected 20 cases each of PC rupture / V – loss of routine ECCE / small incision cataract surgery and phaco emulsification.

CRITERIA :

Any cases with pathology likely to effect outcome were excluded such as cases with previous trauma, intra-ocular uveitis, retinal breaks or detachments, apparent diabetic maculopathy, retinal vessels occlusion and amblyopia. Also cases with pre-operatively clinically detected subluxated lens / zonular dialysis which resulted into vitreous loss intraoperatively are excluded.

Only cases with PC rupture / zonular dialysis with or without vitreous loss without any preoperative predisposing factors were included in our study.

PREOPERATIVE ASSESSMENT

Intraop evaluation :

Operative details were recorded to access the various factors that influence surgical procedure.

Pupillary Dilatation : Whether fully dilated / semidilated or constricted

Anaesthesia : All cases were given peribulbar / retrobulbar blocks.

Lid sutures :

Superior rectus bridle suture was used to fix the globe in all cases. An inferior suture was employed

when considered necessary.

Incision :

Routine ECCE – mid limbal incision with 15 number blade and entry with 11 number blade.

Small incision – scleral tunnel made with 15 number (kehr red blade) and crescent knife with anterior chamber entry keratome. A second stab incision was made at 2 O'clock.

Phaco emulsification : 3 mm scleral tunnel / clear corneal incision. Incision was later extended to 5.5 or 6 mm for the insertion of lens implants. Two stab incisions at 2 O'clock and 10 O'clock was made as in SICS (small incision cataract surgery).

Capsulotomy / capsulorrhexis (CCC) :

Note was made

-whether capsulotomy with flaps or not

-whether CCC complete or not (size ranges for 4mm to 7mm) with or without tear.

Shapes ranged from circular, vertical or horizontally oval to capsulotomy with ragged edges to capsulotomy with peripheral linear extension.

These were done by 26 no BD needle capsulotome.

A relaxing incision in the CCC was made in cases of SICS.

Hydrodissection :

With 26 no. BD cannula filled with ringer lactate solution. Note was made whether hydro was achieved or not and whether there was any difficulty in nucleus rotation. In SICS nucleus was made to come into the anterior chamber while in phaco it was maintained with the bag.

Nucleus delivery :

Routine ECCE : pressure counter pressure by vectis and spatula.

Small incision : (SICS) : VISCO expulsion through the tunnel

PHACO : in the bag divide and conquer (Gimbel) Or stop and chop (modified Koch) methods were applied

for nucleus management. Machine used – peristaltic type – with 30° phaco probe. Phacopower used

First groove	Nuclear density
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0-29%	1+
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30-49%	2+
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50-79%	3+
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In all three types of surgeries visco elastic material was used.

Irrigation / Aspiration :

Manual irrigation / aspiration by simcoe cannula note was made whether it has antero superior opening. Bimanual irrigation / aspiration mainly done in phaco emulsification cases.

Lens implant :

What type of IOL (AC or PC or Scleral fixated) used
Whether it was placed in the bag or in the ciliary sulcus or in the anterior chamber.

Any other stages at which PC rupture with or without vitreous loss occurred were noted.

Observing vitreous strands adherent to cotton bud, movements or peaking of the pupil specially when iris is swept with spatula are regarded as definite signs of vitreous loss in this study.

Vitrectomy :

By scissors or automated cutter

Intra op Medication :

Whether mannitol (20% was used or not).
Post operative slit lamp examination to look for any flare / cells / vitreous in anterior chamber / lens centration.

Post operative visual acuity :

First day

Corrected V/A after 10 weeks.

Slit Lamp evaluation to look for any vitreous strands / IOL decentration / inflammation.

RESULTS:

Table - 1

Incidence of posterior capsule(PC) rents

Type of surgery	Total No. of cases	No of cases with PC rent
Routine Extracapsular Cataract Surgery (ECCE)	1000	65 (6.5%)
Small incision cataract surgery (SICS)	600	24 (4%)
Phacoemulsification	220	21 (9.54%)
Total No. of cases	1820	110 (6.04%)

Table - 2

Stage of operation at which PC rent occurred	ECCE	SICS	PHACO
Irrigation/Aspiration	65% (13)	65% (13)	50% (10)
Nucleus removal	20% (4)	5% (1)	35% (7)
Others	15% (3)	30% (6)	15% (3)

Stage of operation	No (%) of cases	
	With Vitreous loss	Without vitreous loss
Nucleus expression	6%	9%
Cortical cleanup	40%	20%
Removal of anterior capsular flap	5%	0%
Posterior capsule cleaning	0%	0%
PC IOL implantation	10%	0%

IOL implant in cases with posterior capsule rupture

Table - 3

Type of Intraocular lens	ECCE	SICS	Phaco
Posterior Chamber IOL	75%(15)	95%(19)	90%(18)
Anterior Chamber IOL	20%(4)	5%(1)	5%(1)
Scleral suture fixated IOL/Aphakia	5%(1)		5%(1)

Distribution of cataract in cases with PC rupture

Table - 4

Extracapsular cataract surgery)ECCE)

Type of cataract	Percentage(No of cases) with posterior capsule rupture
Mature	50%(10)
Immature	35%(7)
Hypermature	5%(1)
Posterior subcapsular	10%(2)

Distribution of cataract in cases with PC rupture

Table - 5

Phakoemulsification

Type of cataract	Percentage(No of cases) with posterior capsule rupture
Grade III-nuclear sclerosis	60%(12)
Post subcaps cat+nuclear sclerosis-Grade II	10%(2)
Post subcaps cat + nuclear sclerosis- Grade I	25%(5)
Grade I-nuclear sclerosis	5%(1)

Relationship between type of IOL used and CCC/capsulotomy

Table 6

Continuous Curvilinear Capsulorrhexis

Type of Intraocular Lens	No of cases with Continuous Curvilinear Capsulorrhexis	No of cases with capsulotomy
Anterior Chamber IOL	1	5
Posterior Chamber IOL	42	12

Table 7

Comparison of corrected final visual acuity between Extracapsular Cataract Surgery (ECCE), Small incision and Phakoemulsification

No of patients	Visual acuity >6/12	Visual acuity <6/12
ECCE	15	5
Small Incision	17	3
Phakoemulsification	18	2

The overall results in terms of visual acuity and morbidity were better in Phaco emulsification and small incision compared to routine ECCE.

The final corrected visual acuity of 6/12 or better was obtained in 90% and 85% of cases of phakoemulsification and small incision cataract surgery respectively while it was 75% of the cases of routine ECCE (extra capsular cataract surgery) which got that much vision.

DISCUSSION

The present study includes 60 operated eyes with PC rent with 20 each of routine ECCE, small incision and phakoemulsification techniques of cataract surgery.

Our present analysis of 1820 cases oper-

ated in our institute over a period of 2 years showed an overall incidence of posterior capsular rent of 6.04%; while in ECCE incidence was 6.5%, in small incision and phacoemulsification it was 4% and 9.54% respectively.

IN EXTRACAPSULAR CATARACT EXTRACTION – most PC rents occur during irrigation/ aspiration- 60% (12 cases).

During irrigation / aspiration disproportionate suction through the syringe while aspirating cortex lead to PC rupture. Also due to inadequate capsulotomy with the ragged anterior capsular flaps, anterior cortex aspiration with front opening simcoe's cannula was one of the cause for PC rupture with Vitreous loss-20% (4 cases). Rarely zonular breaks occurred during capsulotomy especially in hypermature cataract-5% (1case). Difficult nucleus delivery with excess pressure due to inadequate incision was the cause in 15% of cases for PC rupture. Inadequate hypotony resulted in PC bulge particularly in young patients with soft nucleus. A 15 degree head up tilt was found to cause significant decrease in vitreous bulge²⁴. Deep cut during capsulotomy can extend into posterior capsule-5% (1 case) especially in thin nucleus of young patients.

IN SMALL INCISION CATARACT SURGERY, here also most cases of PC rupture occurred during irrigation/aspiration – 65% (13 cases). Out of these thirteen cases 10 cases of PC rent occurred during aspiration of subincisional cortex. 2 cases (10%) occurred after constriction of pupil due to much manipulation during delivery of nucleus into anterior chamber. 5% cases were due to brown hard cataract. In this case the nucleus was too hard to mould within scleral tunnel to come out, leading to excessive pressure with consequent zonular dialysis superiorly with Vitreous loss.

Peripheral extension of continuous curvilinear capsulorrhexis lead to tears extending to Posterior capsule in 2 cases (10%). PC polishing to remove PC opacification lead to inadvertent PC rupture in 10% (2 cases) so it is better to leave behind a small PC opacity unless it is within the visual axis and one is confident of polishing. Such opacities can always be lasered later. In 5% (1case) hydrodissection lead to tears in the Posterior capsule.

Over all the incidence of vitreous loss was comparatively minimal even after PC rent in small incision cataract surgery when compared with routine extra capsular cataract surgery. Out of a total of 20 cases only 8 cases (40%) had vitreous loss compared to 70% in routine ECCE.

IN PHACOEMULSIFICATION, irrigation / aspiration still stands first among the causes of PC rent accounting for 50% (10 cases). Out of this,

20% (2 cases) happened during irrigation/aspiration. 3 cases (15%) were found to be caused by use of a simcoe cannula in which aspiration port is at the front instead of usual position of antero superior. 5 cases (25%) occurred during aspiration of epinuclear sheath.

3 cases (15%) occurred during sculpting; out of this two cases (10%) occurred during deep sculpting when inadvertent tip occlusion lead to aspiration of post capsule. Our phaco tip used was of 30° angulation. In one case (5%) tip and dialer used for soft nucleus dissociation sank through and ruptured the posterior capsule.

During emulsification of nucleus particles a total 4 cases (20%) of PC rupture occurred. Out of these in 2 cases (10%), the PC rent happened during emulsification of the last quadrant when surrounding capsule was unprotected. In the other three cases (15%) inexperienced peripheral aspiration efforts applied when tip was close to the capsule were the cause. In 5% (1 case) the nucleus dropped into the vitreous and the case was subsequently referred to a posterior segment surgeon. Posterior nucleus dislocation, a rare complication occurs if one proceeds with phaco in the presence of radial or posterior capsular tear. Presence of phaco tip and second instrument on nuclear quadrants in presence of radial tear in the capsulorhexis margin result in trap door formation resulting in nucleus or nuclear fragments dislocations⁷. The risk threshold rose dramatically with increasing experience of phacoemulsification.

In our study PC rupture was more common in Grade III nuclear sclerosis followed by soft posterior subcapsular cataract. Also the majority of rents amongst hard cataract occurred during nucleus removal whereas amongst soft posterior subcapsular cataract it was in the stage of epinuclear shell removal and irrigation / aspiration that the majority of rents happened.

Final visual outcome was acceptable (more than 90% of cases got 6/12 or better vision post-operatively after ten weeks. In most of the cases mannitol 100 cc. 20% was used intraoperatively as intravenous bolus injection whenever PC rupture with vitreous loss. This made vitrectomy easier and complete. It lead to implantation of IOL in a smoother fashion and without any further damage to posterior capsule.

Overall our conclusions in the study are :-

1. There is no sex and age predilection for PC rupture found in our study, although very young or very old cases are at greater risk specially when handled by an inexperienced surgeon. Either very immature or hyper-mature cataract are also more prone for PC rupture with vitreous loss.
2. The PC rupture with vitreous loss is among the

most common complications of cataract surgery. It decreases with the experience of the surgeon.

3. The overall results in terms of visual acuity and morbidity are better in Phaco emulsification and small incision compared to routine ECCE.
4. Cases with CCC are easier to manage as anterior capsular rim is present to support the PCIOL in the ciliary sulcus even after PC rupture.
5. More than 90% of cases can be implanted with a PCIOL, which gives better vision with less morbidity as compared to ACIOL.
6. In ECCE without closed system vitreous loss can be significant and may cause traction to be exerted at vitreomacular interface and vitreous base.
7. Irrigation / aspiration is the most common stage at which PC rupture occurred but in phaco emulsification inexperienced nucleus management specially for the last bit of it also contributes equally.
8. Use of **intraoperative mannitol** after PC rupture is very helpful in handling the situation and thus avoiding further complication.

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