POSTERIOR CAPSULE TEAR IN PHACOEMULSIFICATION OF POSTERIOR POLAR CATARACTS AND UNCOMPLICATED CATARACTS

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ABSTRACT

Objective: The aim of our study was to document the difference in the incidence of posterior capsule tear in phacosurgery of the posterior polar cataract and uncomplicated cataract and to report the visual outcomes of these cases.

Design: A quasi-experimental study.

Place and Duration of Study: CMH Rawalpindi, from Mar 2004 to Mar 2007.

Patients and Methods: The medical records of all patients who had Phacoemulsification surgery during the study period were retrospectively analyzed. Only patients with posterior polar cataracts and uncomplicated cataracts were included. The data of eyes, which developed posterior capsule tear, were further analyzed. Hydrodissection was not done in the eyes with posterior polar cataracts instead gentle hydrodileneation and viscodissection was done. The incidence of posterior capsule tear and the visual outcome were recorded in the two groups.

Results: Out of the 2110 eyes of 1750 patients included in the study, 1735 patients (99.16%) had uncomplicated cataracts (2089 eyes/ 99.001%) and 15 patients (0.86%) posterior polar cataract (21 eyes/ 0.99%). Posterior capsule rupture occurred in 33 eyes (1.56%) of all study patients. It was significantly high in patients with posterior polar cataract 7 cases (PP group) out of 21 eyes (33.33%) than in eyes with uncomplicated cataract 26 (UC group) out of 2089 eyes (1.24%) (P value <0.001). The corrected visual acuity significantly improved inpatients of both groups; 6/12 or better in 21 eyes (80.76%) of 26 eyes in UC group and 5 eyes (71.4%) of 7 eyes in PP group postoperatively.

Conclusion: Posterior capsule rupture occurred more frequently in posterior polar cataract than uncomplicated cataract. If managed by experienced surgeon, the visual outcome is good in both the groups.

Keywords: Posterior polar cataract, posterior capsule tear.

INTRODUCTION

The incidence of the posterior capsule rupture has declined from 4.4% in UK National Survey (1997-1998) [1] to 1.92% reported in The Cataract National Dataset electronic multi-center audit in 2009 which is mainly due to conversion of most ophthalmologists to Phacoemulsification [2], it is reported to be as high as 5.5% when surgery is performed by trainees/ residents [3], as opposed to 0.9% when performed by an experienced phaco surgeon [4]. There are other predisposing factors apart from the surgeon's experience like pseudoexfoliation [5], poorly dilating pupil [6], posterior polar cataract [7] and rent in the anterior capsule or linear capsulectomy techniques [8]. The posterior polar cataract is biggest challenge to the phaco surgeons as far as the posterior capsular tear is concerned with risk of 26-40% [7-9] and phaco surgeons have modified phaco techniques to reduce the incidence with variable results [10-14].

Our study aims to compare the incidence of posterior capsule tear in uncomplicated cataract (senile cataract without ocular co-morbidity) and posterior polar cataracts and documents the visual outcome in these patients. In this way we have tried to exclude other risk factors for posterior capsular tear. To the best of our knowledge, this has not been reported before.

PATIENTS AND METHODS

The medical records of all patients who had Phacoemulsification surgery for uncomplicated cataracts (senile cataract without ocular co-morbidity) and posterior polar cataracts from Mar 2004 to Mar 2007 were

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analyzed. The patients who had ocular co-morbidity (i.e. glaucoma, pseudoexfoliation syndrome, high myopia, high astigmatism or anisometropia, advanced pterygium, corneal dystrophy/ opacities, traumatic/ complicated cataracts, very hard cataracts, advanced diabetic retinopathy, or age related macular degeneration) were excluded.

We collected following data for the patients who had posterior capsule tear (PC tear) during the surgery: age, sex, preoperative visual acuity, surgical complication and postoperative visual outcome at the 6-week follow-up visit. A detailed slit-lamp biomicroscopy of the anterior segment, intraocular pressure and dilated fundus examination were performed in all patients after checking for visual acuity and refraction. The cataracts were evaluated, categorized and documented after dilatation of the pupil.

One experienced surgeons performed all the surgeries under topical anaesthesia. A 3.2mm stepped clear corneal incision was made just inside the 10 o'clock limbus and side port made at 2 o'clock. Continuous curvilinear capsulorhexis was performed under an ophthalmic viscosurgical device (2% sodium hyaluronate) using a capsulorhexis forceps. This was followed by hydrodissection in all uncomplicated cataracts. Hydrodissection was avoided in posterior polar cataracts where gentle hydrodelineation followed by viscodileneation in the same plane was performed in order to avoid stress on the posterior capsule. Phacoemulsification surgery proceeded in the usual way, using a 'divide and conquer' technique for hard nuclei, and the 'chip and flip' technique for soft nuclei. Minimal nuclear rotation was done in posterior polar cases. The phaco parameters used were 20 to 60% phaco power (depending on the hardness of the nucleus), 60mmHg vacuum during trenching and 150-250mmHg during emulsification (only up to 100mm in posterior polar cataracts). The aspiration rate was 20 ml/min and the bottle height at 50-80cm. The epinucleus in the posterior polar cataracts is viscodissected from the cortex and removed with simcoe cannula. The cortical matter was removed by manual irrigation and aspiration with simcoe cannula.

Bimanual automated anterior vitrectomy was performed in cases with posterior capsule rupture and vitreous loss. In cases, where there was small tear in posterior capsule without vitreous loss, anterior vitrectomy was not done. The intraocular lens was placed in the bag or sulcus depending on the amount of capsular support available. In cases where there was no capsular support, primary A.C. IOL was implanted after constriction of the pupil with carbachol. In cases where the pupil did not constrict or the anterior chamber was unstable, no lens was implanted and the secondary A.C. implantation was offered to the patient. All patients had follow-up visits after 1 day, 1 week, 6 weeks, 3 months, 6 months and 1 year. For the first week, a steroid–antibiotic combination was used. After 1 week, steroids were used in tapering doses.

Statistical analysis was done using SPSS version 14 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were used to describe the data. The McNemar test was used for within the group comparison. Chi-square test was used for comparison of two groups. P-value below 0.05 was considered statistically significant.

RESULTS

A total of 2110 eyes of 1750 patients were included in the study, of which 21 eyes of 15 patients (0.86%) had posterior polar cataract and rest of patients had uncomplicated cataracts (2089 eyes of 1735 patients 99.16%). The posterior polar cataract was more in the younger patients (range 24-65 years; mean age 39 years) than in uncomplicated cataracts (range 51-75 years; mean age 63 years). There was no significant gender difference. There Posterior capsule tear (PC tear) occurred in 33 eyes (1.56%) of all study patients. It was significantly higher in patients with posterior polar cataract 7 cases (PP group) out of 21 eyes (33.33%) than in eyes with uncomplicated cataract 26 (UC group) out of 2089 eyes (1.24%) (P value < 0.001). There was only one patient in the PP group who had bilateral PC tear but none in the UC group. Those with posterior

capsule tear (PC tear) were further analyzed including the stage at which the tear occurred, type of the intraocular lens (IOL) used, postoperative complications and the final corrected visual outcome 6 weeks after surgery.

Stage of Capsular Disruption

The capsular tear occurred most frequently during phacoemulsification of the nucleus followed by irrigation and aspiration as is depicted in the table 1. One eye had Capsular dialysis and complete aspiration of the capsule in UC group and none in PP group. Three cases (11.5%) in uncomplicated cataract group and one (14.3%) in posterior polar cataract had to be converted to extracapsular cataract extraction due to impending nucleus drop. The nucleus was removed successfully with irrigating vectus cannula after wxtending the corneal incision and making a relaxing incision in the capsulorhexis. One eye had nucleus drop during phacoemulsification in UC group. This patient was later managed by vitreoretinal surgeon and secondary AC IOL was implanted. Anterior vitrectomy was done in 20 cases (77%) of the UC group and 5 cases (71%) of PP group; it was not done in eyes where the anterior hyaloid face remained intact without vitreous prolapse.

Types of Intraocular Lenses

The posterior chamber lenses were implanted in 19 (73%) of uncomplicated cataracts eyes and 5 (71%) of posterior polar cataract eyes. Anterior chamber IOL were implanted in 7 (26.9%) of UC group eyes and 1 (14.3%) of PP group eyes. One patient in the PP group did not opt for the secondary IOL implantation (Table 2). Foldable IOL were implanted in all posterior chamber implantations except in 3 uncomplicated cataract cases with PC tear cases where rigid lenses were used because of doubtful capsular support. The corneal incision was stitched with 10/0 nylon in all cases who had non-foldable IOL/ AC IOL or who had anterior vitrectomy. Peripheral iridectomy was done in patients who had AC IOL.

Postoperative Complications

Transient raised intraocular pressure and the residual lens matter were the most common postoperative complications (Table 3). There was no case of retinal tear/ detachment or cystoid macular oedema.

Visual Acuity

Preoperatively only 3 eyes had visual acuity of 6/12 or better, 2 (7.6%) in UC group and 1 (14.3%) in PP group which significantly improved to corrected visual acuity of 6/12 or better in 21 (80.76%) of 26 eyes in UC group and 5 (71.4%) of 7 eyes in PP group postoperatively (P value<0.001) (Figure). The post-op visual outcome was comparable in the two groups if we exclude one case of amblyopia in the PP group (P value> 0.5).

Table-1: The intraoperative stage at which disruption occurred

Stage at which disruption occurred	Uncomplicat-ed Cataract (No. of cases)	Posterior polar cataract (No. of cases)
Hydrodissection/ Hydrodileneation	1 (3.8%)	0
Nuclear phacoemulsification	13 (50%)	5 (71.4%)
Irrigation/aspiration	8 (30.7%)	2 (28.6%)
Capsule polishing	2 (7.6%)	0
IOL manipulation	2 (7.6%)	0

Table-2: Intraocular lens (IOL) characteristics

Intraocular lens placement	Uncomplicated cataracts	Posterior - polar cataracts
Endocapsular PC IOL	5 (19.2%)	1 (14.3%)
Sulcus fixated PC IOL	14 (53.8%)	4 (57.1%)
Primary AC IOL	4 (15.4%)	0
Secondary AC IOL	3 (11.5%)	1 (14.3%)
No IOL implanted (aphakia)	0	1 (14.3%)

Table-3: Postoperative Complications

Type of complications	Uncomplicated Cataract (No. of cases)	Posterior - polar cataract (No. of cases)
Transient Raised Intraocular pressure	5 (19.2%)	1 (14.3%)
Residual soft lens matter	4 (15.4%)	2 (28.6%)
Dropped nucleus	1 (3.8%)	0
Corneal burn	2 (7.6%)	0
High postoperative Astigmatism	2 (7.6%)	1 (14.3%)

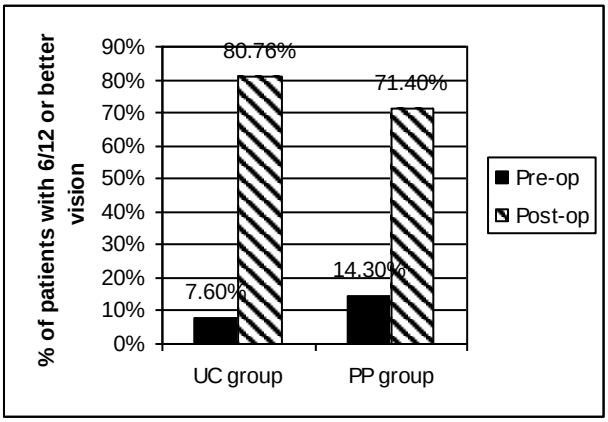

Figure: Post operative findings.

DISCUSSION

Although the incidence of the posterior capsule rupture has declined from 4.4% in UK National Survey (1997-1998) to 1.92% reported in The Cataract National Dataset electronic multi-center audit in 2009 which is mainly due to conversion of most ophthalmologists to Phacoemulsification [2], the posterior polar cataract is still the biggest challenge to the phaco surgeons as far as the PC tear is concerned with reported risk of 26-40% [7, 9].

The posterior polar cataract is white well demarcated circular or rosette shaped opacity on the center of the posterior capsule14 and is usually associated with remnants of the hyaloid system [15]. These are usually inherited in autosomal dominant manner [16] and these autosomal dominant type are genetically heterogenous [17, 18]. The posterior capsule is extremely weak (or perhaps even absent) and firmly adherent to the posterior polar cataract [19] rendering it prone to rupture during cataract extraction [7, 9-11].

Therefore, preserving the posterior capsule in phacoemulsification of posterior polar cataract is special challenge to the Phaco surgeon. Phacoemulsification is preferred over ECCE [20]. Hydrodissection of the cortex followed by nuclear rotation is standard procedure in phacoemulsification but it is contraindicated in posterior polar cataract surgery because of fear of capsular tear so only hydrodelineation without nucleus rotation is done to separate the nucleus from epinucleus. The surgeons have tried to preserve the posterior capsule by modifying their phaco technique [12-15]. Allen and Wood [15] have used gentle viscodissection by injecting viscoelastic between the capsule and the cortex and used low power and low vacuum settings in order to reduce the stress on posterior capsule. Haripriya et al [21] used bimanual microphacoemulsification technique with separate infusion and aspiration instruments enhancing control during phaco with less chances of PC tear. Chee [22] has devised a technique for hard posterior polar cataracts where he cracked the nucleus in the periphery and then chopped in quadrants without rotation. Then the core of the quadrant is engaged while cleaving along the lenticular lamellae sparing the polar cataract. The posterior polar cataract with preexisting capsular rent has been managed by layer by layer phacoemulsification technique [23]. Lee and Lee sculpted the nucleus in the shape of Greek letter lambda followed by cracking along both arms and removal of the central piece (Lambda technique) [24]. We also modified procedure by avoiding hydrodissection, doing controlled hydrodileneation and viscodileation with minimal nuclear rotation and use of low vacuum and low power settings in the posterior polar cataract cases. Despite, all these there were significantly high incidence of PC tear in Posterior polar than uncomplicated cataract group.

If the posterior capsule tear does occur, its management depends upon the adequate removal of the remaining nuclear/ cortical matter, anterior vitrectomy if the vitreous face is disturbed and the placement of the IOL in the appropriate location. This all depends on the surgeon's experience. The visual prognosis is good provided the PC tear is managed by a experienced surgeon and corrected visual acuity has been reported to be 6/12 or better in 60% [25] to 100% [4] of cases which is comparable to that achieved in our study (6/12 or better in more than 80% of patients).

CONCLUSION

In conclusion, our study confirms that posterior capsule tear is more common in posterior polar cataracts than in uncomplicated cataracts. If managed by experienced hands the

visual prognosis is good. Therefore, it is recommended that all cases with posterior polar cataracts should be operated by experienced surgeons who must be conversant to deal with all eventualities.

REFERENCES

1. Jaycock P, Johnston RL, Taylor H, Adams M, Tole DM, Galloway P, Canning C, Sparrow JM; UK EPR user group. The Cataract National Dataset electronic multi-centre audit of 55,567 operations: updating benchmark standards of care in the United Kingdom and internationally. *Eye*. 2009 Jan; 23: 1: 38-49.
2. Desai P, Minassian D, Reidy A. National cataract surgery survey 1997-8: a report of the results of the clinical outcomes. *Br J Ophthalmol* 1999; 83: 1336-40.
3. Allinson RW, Metrikin DC, Fante RG. Incidence of vitreous loss among third year residents performing phacoemulsification. *Ophthalmology* 1992; 99: 726-30.
4. Osher RH, Cionni RJ. The torn posterior capsule: its intraoperative behaviour, surgical management and long term consequences. *J Cataract Refract Surg* 1990; 16: 490-4.
5. Moreno J, Duch S, Lajara J. Pseudoexfoliation syndrome: clinical factors related to capsular rupture in cataract surgery. *Acta Ophthalmol* 1993; 71: 181-4.
6. Guzek JP, Holm M, Cotter JB, Cameron JA, Rademaker WJ, Wissinger DH. Rick factors for intraoperative complications in 1000 extracapsular cases. *Ophthalmology* 1987; 94: 461-6.
7. Osher RH, Yu BC, Koch DD. Posterior polar cataracts: a predisposition to intraoperative posterior capsular rupture. *J Cataract Refract Surg* 1990; **16**: 157–62.
8. Assia El, Apple DJ, Barden A, Tsai JC, Castenada VE, Hoggart J. An experimental study comparing various capsulectomy techniques. *Arch Ophthalmol* 1991; 109: 642-7.
9. Vasavada A, Singh R. Phacoemulsification in eyes with posterior polar cataract. *J Cataract Refract Surg* 1999; **25**: 238–45.
10. Hayashi K, Hayashi H, Nakao F, *et al*.. Outcomes of surgery for posterior polar cataract. *J Cataract Refract Surg* 2003; **29**: 45–49.
11. Gavris M, Popa D, Caraus C, *et al*. Phacoemulsification in posterior polar cataract. *Oftalmologia* 2004; **48**: 36–40.
12. Siatiri H, Moghimi S. Posterior polar cataract: minimizing risk of posterior capsule rupture. *Eye* 2007 May; 21: 5: 674-5.
13. Fine IH, Packer M, Hoffman RS. Management of posterior polar cataract. *J Cataract Refract Surg* 2003; **29**: 16–9.
14. Allen D, Wood C. Minimizing risk to the capsule during surgery for posterior polar cataract. *J Cataract Refract Surg* 2002; **28**: 742-4.
15. Duke-Elder S. Posterior polar cataract. In: Duke-Elder S, Ed, *System of Ophthalmology*, vol.3, pt 2: Normal and Abnormal Development, Congenital Deformities. St Louis, MO, CV Mosby, 1964:723–26.
16. Tulloh CG. Hereditary posterior polar cataract with report of a pedigree. *Br J Ophthalmol* 1955; 39: 374–9.
17. Yamada K, Tomita HA, Kanazawa S, *et al*.. Genetically distinct autosomal dominant posterior polar cataract in a four-generation Japanese family. *Am J Ophthalmol* 2000; **129**: 159–65.
18. Ionides AC, Berry V, Mackey DS, *et al*.. A locus for autosomal dominant posterior polar cataract on chromosome 1P. *Hum Mol Genet* 1997; **6**: 47–51.
19. Hejtmancik JF, Datilles M. Congenital and inherited cataracts. In: Tasman W, Jaeger EA, Eds, *Duane's Clinical Ophthalmology*, CD ROM edition. Baltimore, MD, Lippincott Williams & Wilkins, 2001; 1: chapter 74.
20. Das S, Khanna R, Mohiuddin S M and Ramamurthy B. Surgical and visual outcomes for posterior polar cataract. *British Journal of Ophthalmology* 2008;**92**:1476-1478. 12.
21. Haripriya A, Aravind S, Vadi K, et al.. Bimanual microphaco for posterior polar cataracts. *J Cataract Refract Surg* 2006; 32: 914–7. 13.
22. Chee SP. Management of the hard posterior polar cataract. *J Cataract Refract Surg* 2007; 33: 1509-14.
23. Vajpayee RB, Sinha R, Singhvi A, et al.. 'Layer by layer' phacoemulsification in posterior polar cataract with pre-existing posterior capsular rent. *Eye* 2008; 22: 1008–10
24. Lee MW and Lee YC. Phacoemulsification of posterior polar cataracts — a surgical challenge British Journal of Ophthalmology 2003; 87: 1426-7.
25. Mulhern M, Kelly G and Barry P. Effects of posterior capsular disruption on the outcome of phacoemulsification surgery. *Br. J. Ophthalmol*. 1995;79;1133-7