Original Research Article

Comparison of single stage and two stage capsulorhexis in intumescent cataract surgery: A prospective study in a tertiary eye care center in Eastern India

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Abstract

Introduction- In eyes with intumescent cataracts, creation of continuous curvilinear capsulorhexis is difficult due to high intralenticular pressure and there is high chance of radial extension of capsular tear. **Aim-** To compare the results of conventional single stage and two stage capsulorhexis in intumescent cataract surgery. **Material and method-** A prospective, randomized, interventional study done in a tertiary eye care institute, RIO RIMS Ranchi, India. Seventy four patients of intumescent cataract undergoing phacoemulsification were randomized into two groups. Group I underwent conventional single stage continuous curvilinear capsulorhexis. Group II underwent two stage capsulorhexis in which, initially rhexis of 2.5-3mm size was made and after decompressing the lens, rhexis was enlarged to 5-5.5mm. The data was analyzed using SPSS for Windows software (version 18.0, SPSS Inc., Chicago, IL, USA). Group differences in the continuous variables and categorical variables were analyzed using the student's T test and the Fisher's exact test respectively. **Result-** The study included 74 eyes of 74 patients (41 female and 33 male). Group-1 included 36 patients and group-2 included 38 patients. Radial extension of rhexis occurred in 19.4% and 5.26% of cases in group I and group II respectively. This difference was statistically significant ($p< 0.05$). Argentinian flag sign were seen in 3 eyes (8.3 %) in group I and in 1 eye in group II (2.6 %). None of the patient in either group had posterior capsule rupture. **Conclusion-** Two stage capsulorhexis is safer than single stage capsulorhexis and helps to prevent radial extension of capsulorhexis and makes surgery uneventful.

Keywords: continuous curvilinear capsulorhexis, swollen cataract, Phacoemulsification, "Argentinian flag" sign

Introduction

Intumescent cataract poses special challenge for cataract surgeon. Creation of a well sized, round and centered continuous curvilinear capsulorhexis (CCC) is difficult in intumescent cataract[1]. Due to swollen cortex and high intralenticular pressure, there is high chance of radial extension of capsular tear, giving some times characteristic "Argentinian flag" sign[2,3]. This may lead to various complications including posterior capsule tear, vitreous loss, nucleus drop and intraocular lens (IOL) decentration. Various techniques have been described for controlled capsulorhexis in white, intumescent cataracts such as use of trypan blue dye to stain the anterior capsule[4,5], use of high viscosity viscoelastics to pressurize the anterior chamber[6,7], needle aspiration of liquefied cortex[5,8], phacocapsulotomy[9] and two stage rhexis[10-13]. In two stage rhexis, first deliberately small rhexis of 2.5 – 3 mm is made which is later enlarged to appropriate size after aspirating the liquefied and loose cortex[11]. This study was done to compare the results of conventional single stage capsulorhexis and two stage capsulorhexis in intumescent cataract.

Methods

This was a prospective, randomized, interventional study conducted in a tertiary eye care center in Regional Institute of Ophthalmology, Rajendra Institute of Medical Sciences, Ranchi (India). Seventy four consecutive patients of intumescent cataract above 45 years of age undergoing phacoemulsification between February 2018- January 2020 were included in the study.

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The study followed the tenets of the Declaration of Helsinki and was cleared by the departmental research Committee. Written and informed consent was taken from all patients prior to surgery. Those with traumatic cataract, pseudoexfoliation syndrome and history of any other ocular surgery or not willing to participate in the study were excluded. Baseline demographic data like age, gender, involved eye were noted.

Patients were randomized into two groups based on the randomization table. Group I underwent conventional single stage continuous curvilinear capsulorhexis and Group II underwent two stage capsulorhexis. Our aim was to achieve 5 to 5.5 mm of circular and well-centered CCC. Good CCC was defined as when we were able to make perfect circular, well-centered CCC. Average CCC meant CCC was eccentric and not circular, while failed CCC was extension of CCC into periphery [15].All patients underwent detailed ophthalmological examination including Snellen Visual acuity, Goldman applanation tonometry, detailed slit-lamp biomicroscopy, axial length measurement and keratometry.

Surgical procedure

All surgeries were done by single surgeon having experience of more than 15 years under peribulbar anaesthesia. After making two side port, anterior capsule was stained with trypan blue (0.06%) dye under air bubble. Anterior chamber was filled with cohesive viscoelastic Sodium hyaluronate 1.4% (Healion GV, Abbott laboratories USA). Main incision was made with 2.8 mm keratome at steep axis.

In Group 1, single stage capsulorhexis of about 5- 5.5 mm size was done in very slow and controlled manner. Initial nick on the anterior capsule was made with 26 G needle cystitome. Utrata forceps were used to grasp the capsule and perform the capsulorhexis. If the capsulorhexis tear was directed toward the periphery, more viscoelastic was injected to that part of the anterior capsule.

In Group 2, initially small rhexis of 2.5 – 3 mm was made. After aspirating loose and liquefied cortex using bimanual I/A (irrigation and aspiration) canula, a tangential cut was given at rhexis margin and size of rhexis was enlarged to 5-5.5 mm using utrata's forceps (Fig 1).

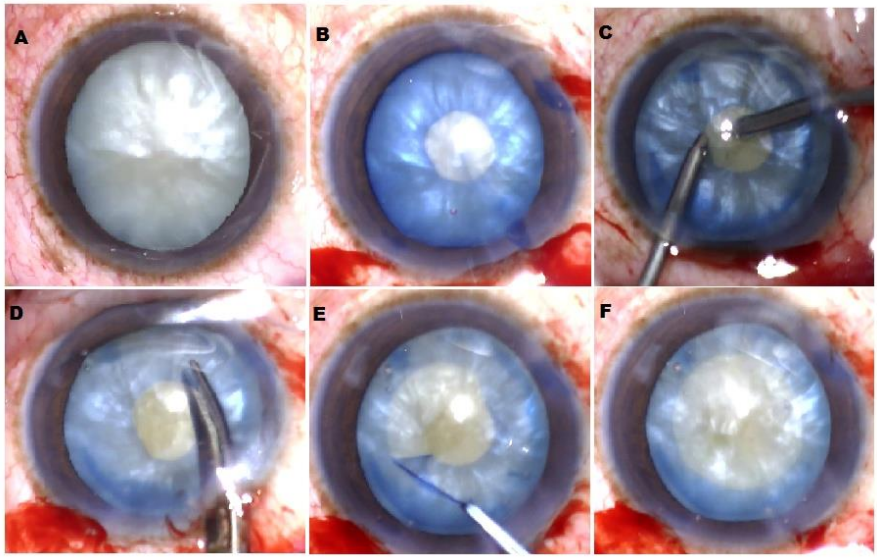

Fig 1: showing steps of two stage rhexis . a) Intumescent cataract, b) Mini rhexis, c) bimanual I/A, d) tangential cut of rhexis margin, e) enlargement of mini rhexis, f) final rhexis

In case of radial extension of rhexis, a small tangential cut was given and capsulorhexis was completed. Endocapsular phacoemulsification were performed in all cases with direct chop technique. Cortical aspiration was done with bimanual I/A canulae and single piece hydrophobic, acrylic IOL was implanted in capsular bag. In cases of extended rhexis, intraocular lens was implantedin such a way that its haptics lies perpendicular to the direction of radialization of rhexis.
Postoperative follow-up were done on day 1, day 7 and day 30. Slit lamp examination was done and intraocular pressure readings were noted during each follow up visit.

Statistical analysis
All data were entered in Microsoft excel and analyzed using SPSS for Windows software (version 18.0, SPSS Inc., Chicago, IL, USA). All continuous variables were expressed as mean with standard deviation and all categorical variables were expressed as proportions. Snellen visual acuity was converted into logmar values for statistical analysis. Group differences in the continuous variables were analyzed using the student's T test whereas group differences in categorical variables were analyzed using the Fisher's exact test. P value of less than 0.05 was considered statistically significant.

Results
The study included 74 eyes of 74 patients (41 female and 33 male).The mean age of patients was 58.6±5.8 years. A comparison of the preoperative characteristics between eyes in both groups is shown in Table 1.

Table 1: showing preoperative characteristics of patients in two groups.

Variable	Single stage rhexis (n=36)	Two stage rhexis (n=38)	p- value (t test)
Age (years, mean±SD)	57.6±4.2	58.2±2.9	0.76
Gender (%, female)	55.5 (20)	55.2 (21)	0.33
Preoperative Visual acuity (logmar, mean±SD)	1.56±0.3	1.64±0.2	0.4

Group-1 (single stage rhexis) included 36 eyes and group-2 (two stage rhexis) included 38 eyes. In Group I, 7 eyes (19.4%) had radial extension of rhexis. In Group II, 2 eyes (5.26%) had radial extension of rhexis which occurred during initial mini rhexis. This difference was statistically highly significant ($p< 0.05$) [Table 2].

Table 2: showing results of CCC in two groups

CCC	Single stage rhexis n (%)	Two stage rhexis n (%)	P value (Fischer's test)
Good	24 (66.7%)	32 (84.21%)	0.02
Average	5 (13.8%)	4 (10.5%)	0.5
Failed	7 (19.4%)	2 (5.26%)	0.01

Argentinian flag sign were seen in 3 eyes (8.3 %) in group I and in 1 eye in group II (2.6 %). Table 2 shows result of CCC in both the groups. Posterior capsule rupture did not occurred in any cases of either group and IOL was implanted in capsular bag in all cases.

Discussion
Staining of anterior capsule with trypan blue dye for better visualization and use of 1.4% sodium hyaluronate high viscosity viscoelastic is helpful in intumescent cataract surgery[4,5]. In our study also, we stained the anterior capsule in all cases and used 1.4% sodium hyaluronate high viscosity viscoelastic.
In a similar study by Kara-Junior N et aldiscontinuity of capsulorhexis was seen in 30.79 % of cases in single stage rhexis where as no discontinuity of capsulorhexis occurred in two stage rhexis[11]. In our study radial extension of rhexis occurred in 19.4 % cases in single stage rhexis and in 5.26 % of cases in two stage rhexis. Vasavada et al studied 60 eyes of 60 patients with senile white mature cataracts[12]. A small capsulorhexis was attempted initially, and phacoemulsification was performed. The capsulorhexis was enlarged before intraocular lens implantation. In that series, CCC was achieved

in 95% of cases. In our study also, CCC was achieved in 94.74 % of cases in two stage rhexis.

In a study by Gimbel et al, anterior capsule tears occurred in 11.7% of cases during the first capsulotomy and 4% required to be converted to a can-opener capsulotomy[10]. In our study, none of the patients converted to can opener capsulotomy.

In a retrospective study of 212 consecutive patients with white cataracts, Chakrabarti et al showed incomplete capsulorhexis in 28.3% of cases, a posterior capsular tear in 1.9% of cases, and the conversion to a manual non-phacoemulsification technique in 1.9% of cases[14]. In our study, none of the eyes had posterior capsular rupture and none of the eyes were converted to conventional extracapsular cataract extraction.

Conclusion

Our study suggested that two stage capsulorhexis in intumescent cataracts are very safe and helps to prevent radial extension of capsulorhexis and makes surgery uneventful. Staining of capsule and use of high viscosity viscoelastics are additional measures recommended in these cases.

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