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**Advantage of Small Incision Cataract Surgery in Eyes with White Mature Cataract: A  
Hospital Based study: Experience as a Beginner**

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## **Abstract:**

**Aim:** To assess the safety & advantage of MSICS in cases of white mature cataract with the use of trypan blue as a supplement for performing continuous curvilinear capsulorhexis.

**Material:** A hospital-based, prospective study was carried out on 50 eyes of 50 patients with uncomplicated white cataract. 50 eyes with cataracts were allocated into two groups; 25 SICS with use of trypan blue (group A) and 25 without (group B). The result in terms of UCVA and BCVA after six weeks with the degree of complications in the two groups were studied.

**Results:** The success rate of CCC was 85% with use of trypan blue dye and remaining 15% were converted to can opener or envelope capsulotomy. All 25 patients (100%) where we had used trypan blue, could put PC IOL in capsular bag. In patients, where we had not used trypan blue, 85% of cases we could put PC IOL in bag, 10% of cases we had put PC IOL in sulcus and in one case (5%) we had put ACIOL. Post-operative UCVA of 6/18 or better at end of 6 weeks were seen in 75% (group A 90% and group B 60%). Post-operative BCVA of 6/18 or better at 6 weeks were seen in 92.5% (group A 100% and group B 85%)

**Conclusions:** MSICS is safe and effective treatment for patients with white cataract, especially with the use of trypan blue dye, even in rural population.

**Key words:** Adjunctive, Best corrected visual acuity (BCVA), Continuous curvilinear capsulorhexis (CCC), Manual small incision cataract surgery (MSICS), Posterior chamber intraocular lens (PCIOL), Trypan blue, Uncorrected visual acuity (UCVA)

## **Background:**

Phacoemulsification is the most exciting success of cataract surgery in 20<sup>th</sup> century. Similar technique of Manual Small Incision Cataract Surgery (MSICS) has evolved as the most popular choice in developing countries. In India, there are about 12.5 million blind and 80% of them are blind due to cataract<sup>1,2</sup>. Most patients have advanced stages of cataract with

intumescent, mature or hyper mature cataract. Most of patients are economically poor and cannot bear surgery like Phacoemulsification. SICS is useful in such advanced cataract because of its low cost. White cataracts constitute a significant volume of cataract surgical load in India.<sup>3,4,5</sup> It is categorized as intumescent milky white cataract, mature, hyper mature or Morgagni an cataract which is based on depth of anterior chamber and status of anterior capsule<sup>2</sup>. It is big challenge to perform MSICS in above three types of cataract because of following reasons: 1] Lack of red reflex<sup>4</sup> 2] Poor contrast between the anterior capsule and underlying cortex 3] High intra-lenticular pressure in intumescent and hyper mature cataract<sup>6</sup> 4] Leaking lens matter from the anterior capsule puncture site 5] In hyper mature cataract, zonules are weak, posterior subluxation of lens may occur 6] Occasional presence of capsular fibrosis<sup>2</sup>. Creating a complete, capsulorhexis and to prolapse the nucleus from the bag into anterior chamber (especially hyper mature cataract where nucleus goes down) are two difficulties encountered during MSICS in eyes with white cataract. Trypan blue assist the surgeon to stain the anterior capsule while performing CCC. Meanwhile welfare of MSICS in white cataract is enhanced by use of trypan blue dye for CCC<sup>2</sup>. In our article, we evaluate intra operative, post-operative results as well as visual status and complications of SICS in white cataract, especially with use of trypan blue.

### **Materials and Methods:**

The present study was conducted over a six-month period from January 2019 to June 2019 at SCEH eye hospital, Lahan. 50 eyes of patients with uncomplicated senile intumescent, mature, hyper mature cataract, attending the OPD were selected. Patients with white cataract but without any other cause of ocular morbidity which would adversely affect the outcome of the surgery were selected. The criteria for exclusion were: Patients with any active corneal disease, corneal opacities or degenerations, uveitis, glaucoma, retinal pathology like any retinopathy or neuropathy. Patients with any major intra or post-operative complications, related to anaesthesia, pregnant women, patients with any previous ocular surgery which

would be excluded. Patients who did not complete 6 weeks of follow-up and patient with system conditions like uncontrolled diabetes which may complicate intraoperative or postoperative visual recovery were excluded.

Investigations like blood pressure, blood sugar and viral markers was carried out in all patients. Detail work up for cataract surgery with complete ocular examination including visual acuity, slit lamp biomicroscopic examination of anterior segment with fundus, grading of white cataract into intumescent, mature or hyper mature, applanation tonometry, syringing of lacrimal sac, biometry and IOL power calculation 50 eyes with uncomplicated cataracts were randomly allocated into two groups: Group A: Included 25 eyes in which MSICS was done with adjunctive use of trypan blue. Group B: Included 25 eyes in which MSICS was done without use of trypan blue. A written informed consent was obtained in each case preoperatively. Preoperatively adequate mydriasis was achieved. A peribulbar injection was given. We allot the patient in two groups before surgery. MSICS with adjunctive use of trypan blue dye in 25 cases and without dye in 25 cases. The dye was injected in half the number of cases in anterior chamber for five seconds to stain the anterior capsule. Postoperatively all patients were treated with Dexamethasone (0.1%) + (Moxifloxacin 0.5%) eye drop 1 hourly for one week followed by tapering dose weekly to stop after one month. All patients were followed postoperatively on Days 1, 10 and 40. During each postoperative visit, UCVA and BCVA was recorded with the help of illuminated Snellen chart. Post-operative slit lamp examination was done on days 1, 10 and 40. Any post-operative complications were noted, with the specific reference to wound related problems, inflammation or cellular reaction were noted.

### **Observations:**

Majority of the patients in both groups belonged to the age group of 60 – 70 year. 50% of patients were females and 50% were males. Surgery (MSICS) was done on: 25 (50%) MSC

(mature senile cataract), 15 (30 %) HMSC (hyper mature senile cataract), 10 (20 %) intumescent type of cataract.

The success rate of CCC was 85% with use of trypan blue dye and remaining 15% were converted to can opener or envelope capsulotomy. All 25 patients (100%) where we had used trypan blue, could put PC IOL in capsular bag. In patients, where we had not used trypan blue, 85% (21 number of cases) we could put PC IOL in bag, 10% (3 number of cases) we had put PC IOL in sulcus and in one case 5% we had put ACIOL. Post-operative UCVA of 6/18 or better on 40<sup>th</sup> day were seen in 75% (group A 90% and group B 60%). Post-operative BCVA of 6/18 or better on 40<sup>th</sup> day were seen in 92.5% (group A 100% and group B 85%)

Zonular dialysis, Posterior capsular rupture and vitreous loss were seen in 3 cases (6 %), out of 25 patients in HMSC where trypan blue was not used. Intra operative miosis was noted in total 6 patients (7.5%), out of total 50 cases. Two patients from A group and four cases from B group. Total of 15 complications was noted in 10 eyes (3 patients of group A, 7 patients of group B). In 6 cases, 5 (12.5%) patients had corneal oedema with Descemet's fold >10 and 1 case (2.5%) in group B had corneal oedema with Descemet's fold <10. Mild iritis was seen in total 3 (7.5%) cases, belonging to group B. Moderate iritis with fibrin membrane noted in 1 case (2.5%) in group B. Endothelial touch were noted in centre of cornea in 2 (5%) cases of, 1(2.5%) belonging to group A and 1(2.5%) belonging to group B. Secondary glaucoma were noted in 2 (5%) of cases, 1 (2.5%) in group A and 1 (2.5%) case in group B. Trauma to iris is noted in one (2.5%) case of in group B where there was intra operative miosis before prolapsing the nucleus in AC. Macular oedema was noted in 1 case (2.5%) post operatively in group B.

Categorizing postoperative visual acuity as per WHO Guidelines-good outcome (6/6-6/18), borderline outcome (<6/18-6/60) and poor outcome (<6/60). Significant complications leading to poor visual performances were minimal and seen only in 1 case belonging to group B (where we had put AC-IOL).

## Discussion

Cataract is the main cause of curable blindness worldwide, with the developing world accounting for three quarters of blindness<sup>8</sup>. White cataract represents an advanced form of cataract<sup>9</sup>. Worldwide millions of peoples were visual impaired from white cataracts. The developing countries cannot afford expensive modern technology to treat these cases<sup>10</sup>. MSICS is not as glamorous as phaco. It gives similar results like phacoemulsification and decreases the chances of nucleus drop. In addition, it can be done without expensive equipment<sup>11</sup>. Phacoemulsification in dense cataract is associated with the greater the possibility of corneal endothelial damage, zonular dialysis and posterior capsular rupture<sup>12</sup>. SICS is very cost-effective compared to phaco. The safety of this procedure in white cataract is enhanced by the use of trypan blue dye as in our study the success rate was 85% with adjunctive use of trypan blue and remaining 15% cases turn to linear or can opener technique. Although we found very good rate of success in completing CCC but still it was very difficult to complete CCC in hyper mature and intumescent type of cataract due to increase in intra lenticular pressure. Venkatesh et al<sup>2</sup> made an observation that satisfactory rate of CCC was 96% with use of trypan blue. Intumescent cataract was converted to can opener technique. Jacob et al<sup>13</sup> shows 3.85% of cases where a CCC had cut out, it had to be turn to extracapsular cataract surgery. This was not seen in our study, as we could comfortably continue a suture less procedure.

All 25 patients (100%) in group A where we had used trypan blue, we could put PC IOL in capsular bag. In group B where we had not used trypan blue, 85% of cases we could put PC IOL in bag, 10% of cases we had put PC IOL in sulcus and only in one case (5%) we had put IOL in anterior chamber. Partial Zonular Dialysis was noted in 1 hyper mature cataract in group B, while prolapsing the nucleus into anterior chamber and there was posterior capsular rupture superiorly. Vitreous loss was seen in same case. Clear total anterior vitrectomy was done and IOL was placed in sulcus. Complete Zonular Dialysis was also noted in 1 hyper

mature cataract where trypan blue was not used (group B) and rhexis was extended beyond mid periphery after nick on anterior capsule. Due to vitreous loss, PC-IOL placement was difficult. So, we place an AC IOL after anterior vitrectomy with cutter. Miosis was found intraoperatively in three patients. Two cases where we had to convert CCC to can- opener. In one case, partial zonular dialysis was noted.

In our study, UCVA of 80% in group A and 60% in group B had good visual outcome on 1 postoperative day, whereas BCVA of 85% in group A and 65% in group B had good outcome on 1 post-operative day. Our results show similar like c Venkatesh et al <sup>2</sup>, in their study, 64% had good UCVA which is mostly 94% on 1 post-operative day.

In our study, on 40th postoperative day, 39 patients (97.5%) had BCVA of 6/18 or better. One patient had visual acuity less than 6/60 after 6 weeks follow up due to ACIOL placement and no case had BCVA less than 6/60.

Our results correlate well with those shown by Dennis et al <sup>14</sup>, who did a study in China showed that UCVA of 6/18 after SICS in their study population was 83.4% and BCVA of 6/18 was in 97% cases after 6 months follow up. Venkatesh et al <sup>2,15</sup> got similar results in one study (MSICS in white cataract) with 94% of eyes having BCVA of 6/9 or better on the 40 post-operative day. They also conducted one study (MSICS in black cataract) in which BCVA of 6/18 or better were achieved in 97.1% of eyes. Minassian et al <sup>16</sup> reported UCVA of 69% in MSICS at end of 6weeks. Riley et al <sup>17</sup> reported BCVA of 88% in MSICS at end of 6 weeks. Henning et al <sup>18</sup> reported higher rates of final UCVA >6/18 with MSICS. Bayramlar et al <sup>19</sup> in their study found VA of 20/40 or better in 75% at 2 months post operatively in MSICS. Kimura et al <sup>20</sup> got final post-operative VA 20/30 or better in 80.4% in MSICS.

Total of 17 complications was noted in 10 eyes (3 patients of group A, 7 patients of group B) which is much higher than the 7%, shown in the study by Gogate et al <sup>21</sup> and 8.5%, shown in the study by Dennis et al <sup>14</sup>. In 6 cases, 5 (12.5%) patients had corneal oedema with Descemet's fold >10 and 1 case (2.5%) in group B had corneal oedema with Descemet's fold

<10. These results were comparable to 2 different studies done by Venkatesh et al <sup>2</sup>. One study, found corneal oedema in 13% of cases, whereas, in another study done to know safety and efficacy of MSICS for brown and black cataract, corneal oedema with Descemet's fold >10 was seen in 14.7% of cases and corneal oedema with Descemet's fold <10 in 4.9% of cases <sup>15</sup>.

So, immediate postoperative complications such as corneal oedema found in 6 cases (15%). It was higher than published results of Phacoemulsification in white cataract <sup>3</sup> raising doubts whether Phacoemulsification is more endothelial friendly. However, all of them were resolved with medical therapy within one week. Mild iritis was seen in total 3 (7.5%) cases, belonging to group B, out of these 2 cases, in 1 case CCC was converted to envelop type of capsulotomy and 1 case there was complete zonular dialysis. In 1 cataract we noted mild iritis where trypan blue was not used, rhexis was too big and PC-IOL was implanted in sulcus. Venkatesh et al <sup>2</sup> in their study found, mild iritis in 6%, moderate iritis with fibrin membrane was seen in 3%. Similar results were also found in another study done by them to know safety and efficacy of MSICS for brown and black cataract, mild iritis in 5.9%, moderate iritis with fibrin membrane in 2.9%.

Only 3(15%) cases in group A, developed post-operative complications, whereas 7 (35%) cases in group B developed complications. In our study Group A show less, complication because we use trypan blue dye which stain the anterior capsule which is visible during surgery and any intraoperative difficulty within bag can be easily found. So, less surgical complication with good outcome occurs. In our study group B shows more complication because we did not use trypan blue dye to stain anterior capsule. 85% of patients in group B had final BCVA > 6/18.

**Summary:** MSICS is a safe and financially effective procedure to be perform in intumescent, mature or hyper mature cataract, which gives good results in terms of visual rehabilitation. Creating a CCC and prolapsing the nucleus from the bag into anterior chamber



(especially hyper mature cataract, where cortex is liquefied and nucleus sinks down) are two difficulties encountered during MSICS in eyes with white cataract. Welfare of MSICS in white cataract is refined by using trypan blue dye. The dye stained the anterior capsule which is helpful for better visualization and in the bag PCIOL implantation. Also, less intra and post-operative complication.

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