An Innovation of Manual Small Incision Cataract Surgery (MSICS: A Technique) for Advanced Cataract Disease in Thailand

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Objective: *Described a new surgical technique of manual small incision cataract surgery (MSICS: A technique), analyze the outcome and complications.*

Material and Method: *The present study was retrospective and non-comparative. The advanced (mature and brunescent) cataract patients were operated with a new surgical technique of manual small incision cataract surgery (MSICS: A technique). Data was collected from medical records between October 2011 and September 2013 at Prasat Neurological Institute. The records of 30 advanced cataract eyes that received surgery were reviewed. The clinical data of visual acuity (VA), pre- and post-operative astigmatism, intraoperative, and post-operative complications, and follow-up from day 1, 5, 28, and 90 post-operative days were collected.*

Results: *Thirty eyes of 25 patients were operated with MSICS (A technique). Post-operative BCVA results were 20/20 or better in 12 eyes (40%), 20/25 to 20/70 in 16 eyes (53.3%), 20/80 to 20/160 in one eye (3.3%), and 20/200 or worse in one eye (3.3%). The different astigmatism was (pre- minus post-operative astigmatism) 0.58±1.12 diopters, range -1.75 to 3.25, 95% CI 0.16-0.99 ($p<0.01$). No major surgical complication was found.*

Conclusion: *The new MSICS (A technique) can be recommended as a safe alternative cataract surgery for mature and brunescent cataract disease in developing countries.*

Keywords: *MSICS, Advanced cataract, Mature cataract, Brunescent cataract, A technique*

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Eye problems are one of the major health problems in the world. Among the countries in the South-East Asia, there were 45 million blind adults and 1.5 million blind children between 1998 and 2000[1]. In 2000, the cost of blindness in this region (e.g., productivity loss, education, and rehabilitation) was about US$ 5.6 billion, thus this cost burden was added to the already poor economies of these countries[1]. At the present trend of interventions, it is estimated that this number will double by the year 2020. Cataract is the most common cause of blindness, responsible for 50 to 80% of all blindness in this region[1]. In Thailand, there are many popular cataract surgery methods such as extracapsular cataract extraction (ECCE) with intraocular lens implantation and phacoemulsification (PE). The number of cataract patients is higher than any other eye diseases. Modern PE machines are expensive to purchase and maintain, relatively high disposable costs, and require extensive surgical training. For more advanced and mature cataracts, performing PE becomes more difficult. A high volume, cost-effective, and low technology procedure that can treat the blindness cataract with a low complication rate in the shortest amount of time is needed. The manual small incision cataract surgery (MSICS) has been recently performed in developing countries[2]. This technique uses the same instrument as ECCE with small incision (around 5-6 mm) by removing through a scleral tunnel, and implanting the intraocular lens[2]. MSICS has lower complications compared with ECCE[2,3]. Furthermore, MSICS not only provides good clinical outcomes but also has lower cost since the PE machine is not needed[2,3]. Therefore, the innovation of MSICS technique, that uses only standard manual extracapsular cataract extraction instruments, is valuable in developing countries. The present study described the new surgical MSICS (A technique) and the preliminary results of the eyes with advanced and mature cataract disease were operated.

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Material and Method

Data were collected from medical records between October 2011 and September 2013 at Prasat Neurological Institute. This present study was approved by the Ethics Review Committee for Research in Human Subjects of Institute. The patient's records of 30 eyes of the advanced (mature and brunescent) cataract patients that consecutively completed surgery had been retrospectively analyzed. Clinical data of visual acuity (VA), astigmatism, intraoperative and postoperative complications, and follow-up from day 1, 5, 28, and 90 post-operative days were collected.

Inclusion criteria

Cataract patients without other ophthalmic diseases that gave informed consent were included. All patients were graded nuclear cataract (NUC) 3 and 9 (WHO Cataract grading)[4].

Exclusion criteria

Patients needing combined surgical procedure, or had other eye disorders capable of compromising vision (amblyopia, glaucoma, diabetic retinopathy or macular degeneration) were excluded. All patients had grading nuclear cataract NUC 1, and 2 (WHO Cataract grading)[4].

The new surgical technique (A technique) used in these cases is as follow:

1. The patient had a sub-Tenon's anesthetic injection in the operating room.
2. Raising a fornix-based conjunctival flap with a 10-2 o'clock peritomy and diathermy was applied.
3. A superior approach, scleral tunnel incision was done tangential to the limbus, length 5-7 mm depending on size of the nucleus. Scleral tunnel should extend 1 mm into clear cornea. The dissected scleral pocket should extend nasally and temporally to the limbus (Fig. 1).
4. A paracentesis was done at 10 o'clock and the bent needle inserted to create the capsulotomy (can-opening or circular capsulorhexis).
5. Anterior cortex was removed by Simcoe irrigation/aspiration cannula.
6. The nucleus was subluxated into the anterior chamber by using Simcoe irrigation/aspiration cannula or bimanual technique (spatula and Sinsky hook).
7. Nucleus removal step: Viscoelastic substance was injected pass superior scleral incision over and under the nucleus to protect the corneal endothelium and depressing the iris. The second paracentesis was done at 4 o'clock. Simcoe irrigation/aspiration cannula was inserted though this paracentesis and moved the eye downward. Then gentle depression the inferior scleral lip was done with spatula to open the corneoscleral tunnel. When one third of the nucleus passed the corneoscleral tunnel, the water valve of Simcoe irrigation/aspiration cannula was turned on to add hydrostatic pressure in the anterior chamber for nucleus removal. The hydrostatic pressure was maintained until the nucleus was removed completely (Fig. 2).
8. The Simcoe cannula was used to remove the epinuclear and cortical cortex by hydroexpression technique combined with conventional technique.
9. The intraocular lens (IOLs) insertion step had two alternative techniques.

Air technique: Air is injected into the anterior chamber pass paracentesis site. A polymethymethacrylate

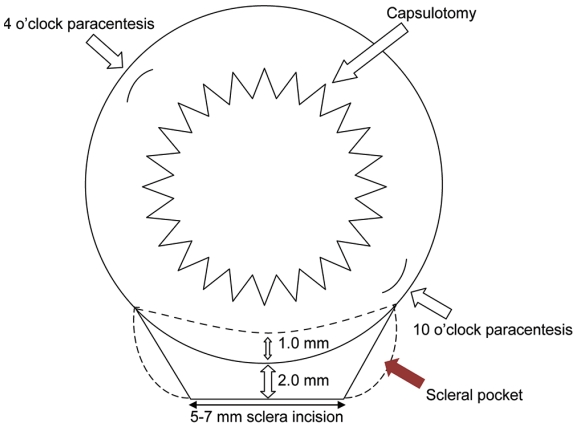

Fig. 1 Manual small incision cataract surgery (A technique).

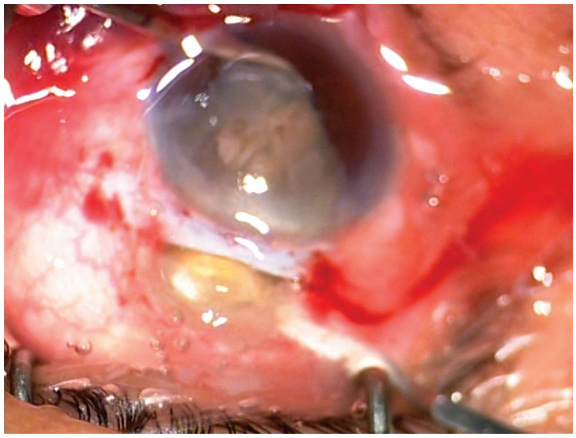

Fig. 2 Nucleus removal.

IOLs is inserted passed the corneoscleral tunnel wound. The anterior chamber is maintained with injected air while IOLs is inserted.

BSS technique: After IOls is inserted into the anterior chamber except the second haptic, the Simcoe irrigation/aspiration cannula is inserted passed the second paracentesis to maintain the anterior chamber with BSS. Then the second haptic is inserted into the capsular bag under the BSS.

10. The stromal hydration technique is done at both paracentesis site until anterior chamber is maintained. In cases where the length of corneoscleral wound is more than 6 mm or pre-operative against the rule astigmatism eye (more than 2.00 diopters), we suture the wound with one stitch of 10-0 nylon. Sub-conjunctival injection of antibiotic and steroid is done at the superior conjunctival wound.

Statistical analysis

Data were converted to Microsoft Excel 2010, and analysis was made with Paired t-test. The software program SPSS for Windows version 16.0 (SPSS Inc., Chicago, Illinois, USA) was used.

Results

Thirty eyes of 25 patients were operated with MSICS (A technique) by one surgeon (A.J.) and were recorded in this study. Thirty eyes had preoperative uncorrected visual acuity (UCVA) between 20/200 and perception of light (PL), 24 eyes (80%) and six eyes (20%) had between 20/80 and 20/160 (Fig. 3). At three months after surgery, UCVA was 20/20 or better in four eyes (13.3%), 20/25 to 20/70 in 21 eyes (70%), 20/80 to 20/160 in four eyes (13.3%), and 20/200 or worse in one eye (3.3%). Of BCVA, results were 20/20 or better in 12 eyes (40%), 20/25 to 20/70 in 16 eyes (53.3%), 20/80 to 20/160 in one eye (3.3%), and 20/200 or worse in one eye (3.3%). All data are shown in Fig. 3. One eye at 20/200 had IOLs decenter.

Using preoperative keratometry (Auto Ref-Topographer RT-7000, Tomey Corporation, Nagoya, Japan) as a baseline, and without regard for axis, the mean corneal astigmatism was 1.39±1.35 diopters, range 0.25 to 6.25, 95% CI 0.89 to 1.89. At the post-operative keratometry at 28 to 90 days, 30 eyes (100%) had a mean corneal astigmatism of 1.97 diopters ±1.55, range 0.25 to 7.00, 95% CI 1.39 to 2.55. Comparing pre-operative with post-operative corneal astigmatism for each eyes, without regards to axis, the amplitude of change had a mean of 0.58±1.12 diopters, range -1.75 to 3.25, 95% CI 0.16 to 0.99 (p<0.01) (negative being a worsening of astigmatism) was shown in Fig. 4.

There were few post-operative complications. One eye had IOLs decentered and reposition after three months post first operation, one eye had hyphema, height 3 mm at first post-operative day and resolved in first week after surgery, and one eye had the central corneal edema and resolved in first week. No major surgical complications were found in the present study.

Discussion

Small incision cataract surgery results in less induced astigmatism and faster visual rehabilitation. Phacoemulsification is the best method to achieve this result[5-8]. However, the high cost of the phacoemulsification unit and the maintenance costs prevent its use by many surgeons in developing countries. Manual techniques have been developed to achieve benefits similar to those of phacoemulsification[9-11]. Cost analysis of this technique

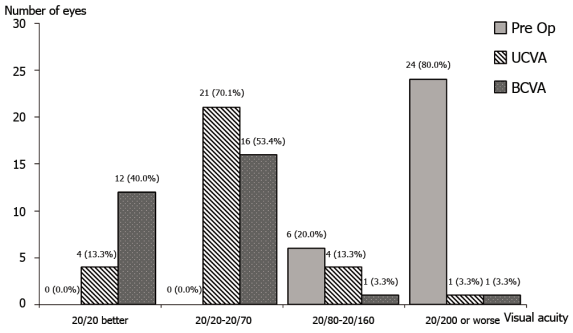

Fig. 3 Distribution of patients (eyes), pre and postoperative visual acuity.

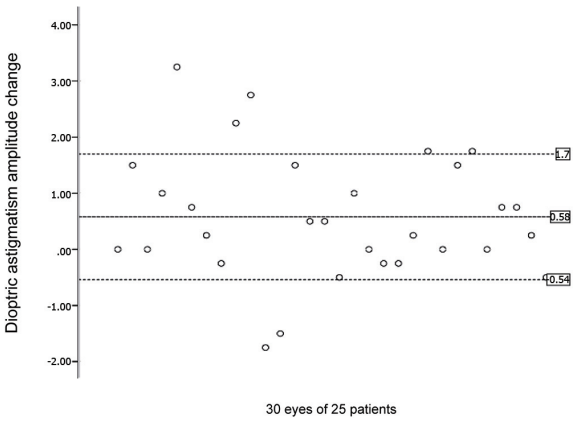

Fig. 4 Post-operative astigmatism amplitude change (+0.58 diopters ±1.12 SD) at 28 to 90 postoperative days.

is a comprehensive analysis of surgical complication rate, post-operative visual acuity and post-operative astigmatism[12,13]. MSICS (A technique) is a new method of MSICS developed by the author. In present study, it had good post-operative BCVA (20/20 or better 20/70) at 83.3%, good post-operative astigmatism at 0.58±1.12 diopters, and low major surgical complication rate even in advanced cataract (mature and brunescent cataract).

MSICS is an economical and adaptable technique that is appropriate for cataract surgery in developing countries. MSICS (A technique) has many benefits, including low cost, not induced high astigmatism, and decreased of severe complications (posterior capsular rupture, dropped nucleus during surgeries)[14,15]. Central corneal edema has been reported to be a significant post-operative complication of MSICS[2]. In present study, only one eye had this complication. A technique may be recommended as a safe and effective alternative to phacoemulsification and ECCE, particularly in advanced cataract disease. Further studies are recommended to compare with the phacoemulsification in same grading of cataract disease and in the same situation.

What is already known on this topic?

MSICS is the surgical techniques that widely use in developing countries: India, China, Napal, and Thailand. The technique is appropriate for hard cataract than phacoemulsification. However, some techniques caused serious complication; corneal decompensation, dropped nucleus.

What this study adds?

All techniques of MSICS need the special instruments. Therefore, if the ophthalmologists want to perform this surgical technique, they have to prepare the special instruments before surgery. The author's new technique (A technique) uses only conventional instruments of ECCE (all hospitals in Thailand already have). The author has used the A technique at Prasat neurological institute more than 3 years. The present study was retrospective to proof the safe and effective of this new technique.

Potential conflicts of interest

None.

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นวัตกรรมการผ่าตัดต้อกระจกแผลเล็กวิธี A technique สำหรับผู้ป่วยต้อกระจกระยะท้ายในประเทศไทย

อัมพร จงเสรีจิตต์, ศิริพร แสงหิรัญ

วัตถุประสงค์: *เพื่อบรรยายวิธีการผ่าตัดต้อกระจกแผลเล็กวิธีใหม่ (MSICS: A technique) รวมถึงวิเคราะห์ผลการผ่าตัดและภาวะแทรกซ้อน*

วัสดุและวิธีการ: *การศึกษานี้เป็นการศึกษาย้อนหลังและไม่เปรียบเทียบ โดยเก็บข้อมูลจากเวชระเบียนผู้ป่วยต้อกระจกระยะท้าย (brunescent and mature cataract) ที่ได้รับการผ่าตัดต้อกระจกแผลเล็กวิธีใหม่ (MSICS: A technique) ตั้งแต่เดือนตุลาคม พ.ศ. 2554 ถึง กันยายน พ.ศ. 2555 ที่สถาบันประสาทวิทยา จำนวน 30 ตา บันทึกค่าสายตาและค่าสายตาเอียงก่อนและหลังการผ่าตัดวันที่ 1, 5, 28, 90 รวมถึงภาวะแทรกซ้อนของการผ่าตัด*

ผลการศึกษา: *ผู้ป่วย 25 ราย 30 ตา ได้รับการผ่าตัดต้อกระจกแผลเล็กวิธีใหม่ (MSICS: A technique) ค่าสายตาหลังผ่าตัด (BCVA) 20/20 หรือดีกว่า 12 ตา (40%), ค่าสายตา 20/25-20/70 มี 16 ตา (53.3%), ค่าสายตา 20/80-20/160 มี 1 ตา (3.3%) และค่าสายตา 20/200 หรือแย่กว่ามี 1 ตา (3.3%) ค่าสายตาเอียงที่เปลี่ยนไป (pre minus postoperative astigmatism) 0.58±1.12 diopters, range -1.75 to 3.25, 95% CI 0.16-0.99 ($p<0.01$) ไม่พบภาวะแทรกซ้อนที่ร้ายแรง*

สรุป: *วิธีการผ่าตัดต้อกระจกแผลเล็กวิธีใหม่ (MSICS: A technique) เป็นวิธีการผ่าตัดที่เหมาะสมและปลอดภัยโดยเฉพาะโรคต้อกระจกระยะท้ายหรือสุกในประเทศกำลังพัฒนา*
