ARTICLE

Supervised resident manual small-incision cataract surgery outcomes at large urban United States residency training program

Ross Lynds, MD, Brock Hansen, MD, Preston H. Blomquist, MD, V. Vinod Mootha, MD

Purpose: To examine the outcomes of resident-performed manual small-incision cataract surgery (SICS) in an urban academic setting.

Setting: Parkland Memorial Hospital, Dallas, Texas, USA.

Design: Retrospective case series.

Methods: Manual SICS was used only in selected cases for which phacoemulsification was expected to be difficult, namely for mature or brunescent cataracts, traumatic cataracts, and pseudoexfoliation syndrome or other causes of zonular weakness. All manual SICS cases performed by resident physicians as the primary surgeon over a 5-year period were reviewed. Postoperative visual acuity, intraoperative complications, and early postoperative complications were the main outcomes measured.

Results: For the 52 cases identified, the mean preoperative visual acuity was 2.165 logarithm of the minimum angle of resolution (logMAR) ± 0.141 (SD) (95% confidence interval) (slightly better than had motion acuity), improving to 0.278 ± 0.131 logMAR (Snellen 20/38) corrected visual acuity postoperatively. Of the 52 cases, the most frequent intraoperative complications were iris prolapse (5 cases [9.6%]) and zonular dialysis (4 cases [7.7%]), with vitreous loss occurring in 1 case (1.9%). The most frequent postoperative complications were cystoid macular edema (3 cases [5.8%]), retained ophthalmic viscosurgical device (2 cases [3.8%]), intraocular lens displacement (2 cases [3.8%]), and microhyphema (2 cases [3.8%]).

Conclusions: Although the more advanced wound construction in manual SICS might be challenging to surgeons unfamiliar with the technique, it was a safe and efficacious technique in the hands of learning residents. With several advantages over phacoemulsification, such as cost and ability to remove very dense nuclei, manual SICS will play a valuable role in modern cataract surgery.

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Cataracts represent a leading cause of preventable blindness worldwide, second only to uncorrected refractive error as a cause of visual impairment.[1] Obtaining proficiency at surgical cataract extraction techniques comprises 1 of the most essential aspects of an ophthalmologist's residency training. In the United States, phacoemulsification is the most frequently used technique. Thus, residency training programs have shifted toward emphasizing the learning of this technique far beyond extracapsular techniques, with over 60% of recent residency graduates performing 2 or fewer cases of extracapsular cataract extraction (ECCE).[2] Extracapsular cataract extraction and manual SICS are significantly less frequently used domestically but still represent currently used techniques internationally, especially in developing nations. One advantage of manual SICS that accounts for its popularity abroad is its significantly lower cost, using much more affordable and easier to maintain instrumentation.[3] In addition, studies performed at international centers[4–8] have shown that manual SICS can be done with extreme efficiency, has better outcomes than ECCE, and has visual results comparable to those achieved with phacoemulsification. Although it is unlikely to supplant phacoemulsification in the U.S. as the primary surgical approach to cataract extraction, manual SICS has potential advantages over phacoemulsification in the surgical management of very dense mature cataracts.

Mature and extremely brunescent cataracts are among the most difficult cases cataract surgeons encounter in experienced hands and even more so during training.

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From the Texas Southwestern Medical Center, Dallas, Texas, USA.

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Corresponding author: V. Vinod Mootha, MD, University of Texas Southwestern Medical Center at Dallas, 5323 Harry Hines Boulevard, Dallas, Texas 75390-9057, USA. E-mail: vinod.mootha@utsouthwestern.edu.

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Manual SICS avoids the high amount of phacoemulsification energy required to remove these large dense cataracts along with the resultant effect on the endothelium and zonular fibers. Manual SICS should reduce operative times in these cases for which considerable time and effort is required to emulsify mature cataracts in comparison to removing them through a manual SICS wound. Manual SICS results in less manipulation of the nucleus inside the capsular bag and could result in lower rates of posterior capsule rents and vitreous loss. As an additional benefit to training ophthalmologists in the in U.S., learning manual SICS could benefit those who desire to spend time internationally, especially in the developing world where phacoemulsification equipment might not always be available.

Although other studies have assessed the efficacy and safety of manual SICS performed by experienced surgeons and of resident-performed manual SICS done abroad,[9] to the authors' knowledge, this is the first study of outcomes of manual SICS performed in residency training domestically in the U.S. In addition, this study represents the largest series of U.S. resident-performed cases, with 52 cases compared with 30 cases performed abroad in the previous report by DeCroos et al.[10]

PATIENTS AND METHODS

This study was approved by the Institutional Review Board of the University of Texas Southwestern Medical Center and was performed in compliance with the tenets of the Declaration of Helsinki.

Patient Population

This study is a retrospective review of consecutive cases of manual SICS performed under the supervision of 1 attending faculty surgeon (V.V.M.) at Parkland Memorial Hospital, Dallas, Texas, USA, between April 2005 and August 2012. All cases of cataract surgery staffed by V.V.M. were reviewed and any cases that began with a clear corneal incision were excluded. Cases of planned manual SICS were included. In all cases, a resident physician was the primary surgeon. The patient population is representative of a large urban county hospital setting.

Demographic data collected includes age, sex, race, and surgical eye laterality. Preoperative corrected distance visual acuity (CDVA), cataract grade, preoperative refraction, intraocular pressure (IOP), history of trauma, zonular weakness, pseudoexfoliation syndrome, and other ocular comorbidities were recorded. Intraoperative complications were recorded along with the presence of capsule-relaxing incisions, anesthesia type, and number of sutures used to close the main wound. Visual acuity and IOP were recorded at postoperative day 1, postoperative week 1, and postoperative month 1. Any late complications encountered over the course of postoperative follow-up were recorded. The postoperative medications included topical prednisolone acetate 1.0%, which was tapered over a month, and topical moxifloxacin, which was used for 1 week. Intraocular pressure–lowering agents were used as necessary in eyes with increased pressure.

Surgical Technique

The procedure began with a temporal 3 clock hour peritomy to the bare sclera. Cautery was applied to the sclera for hemostasis. The sclera was dried and a 9.0 mm planned incision cord length was marked with calipers 1.0 mm posterior to the limbus. A crescent blade was used to make the incision at approximately 50% of the scleral depth between the 2 marks. Next, the lip of the scleral incision was extended by angling the crescent blade to 45 degrees, with subsequent dissection in a lamellar plane 2.0 mm into clear cornea with the crescent blade. A trapezoidal corneoscleral wound was constructed with an internal base of 11.0 mm. Paracentesis wounds were made at 3 o'clock and 8 o'clock, large enough for bimanual irrigation/aspiration (I/A), approximately 0.8 mm in width. Trypan blue was used to stain the anterior capsule for visualization of the continuous curvilinear capsulorhexis (CCC) and was then irrigated with a balanced salt solution. The anterior chamber was filled with an ophthalmic viscosurgical device (OVD) and then a 3.0 mm keratome was used to enter the anterior chamber through the previously fashioned corneoscleral wound.

A large CCC was performed, aiming for 7.0 to 7.5 mm in diameter. Hydrodissection was then performed. At this point, it was determined whether multiple subincisional relaxing incisions in the anterior capsule should be made with the cystotome to facilitate nucleus delivery. The OVD was injected into the anterior chamber above the lens. At this point, the corneal wound was enlarged to its full extent with the keratome. The subincisional nucleus was prolapsed into the anterior chamber with an Ogawa standard dialer (Duckworth & Kent Ltd.) and an OVD cannula. The OVD was injected posterior to the nucleus to push back the posterior capsule and facilitate delivery of the nucleus into the anterior chamber. For removal of the lens, the nucleus was sandwiched out with a cyclodialysis spatula and lens loop. Cortex removal was subsequently performed with bimanual I/A, with placement of a suture in the main wound if required to maintain anterior chamber depth and assist in cortical cleanup. After completing the cortical cleanup, the bag was filled with OVD.

A 3-piece acrylic intraocular lens (IOL) (MA60AC, Alcon Laboratories, Inc.) was used in cases of adequate capsule support. A 1-piece poly (methyl methacrylate) (PMMA) IOL with haptic islets (CZ70BD, Alcon Laboratories, Inc.) was used in cases of inadequate capsule support.

Removal of any tied sutures was done before placement of a 3-piece IOL in the capsular bag using Kelman-McPherson forceps. Placement of approximately 3 interrupted sutures in the main wound was performed using 10-0 nylon, followed by removal of the OVD with bimanual I/A. The IOL was centered and acetylcholine chloride was administered. The paracentesis wounds were hydrated and the anterior chamber inflated. The sutures were buried and the wounds checked for stability with additional sutures as necessary. Closure of the conjunctiva was completed with 9-0 polyglactin absorbable sutures.

Statistical Analysis

The Student *t* test was used to compare mean differences between paired groups. Analysis of variance (ANOVA) was used to compare demographic groups with more than 2 groups. The 95% confidence interval (CI) was determined for mean outcomes.

RESULTS

Table 1 shows the baseline demographics of the study population. The study comprised 52 patients (34 women and 18 men, $P = .027$). The mean age was 69 years $\pm$ 2.77 (SD) (range 51 to 94 years of age). There were more right eyes than left eyes ($P = .27$). Thirty-four cases were performed under general endotracheal anesthesia and 18 cases were performed using retrobulbar anesthesia. The total mean follow-up time was 9.4 $\pm$ 3.7 months, ranging from 1 week to 84 months.

The preoperative examination showed that there was preponderance of brunescent and white mature cataracts (57.7% of 52 cases were brunescent cataracts whereas 38.5% of 51 cases were mature white cataracts; this accounted for 50 [96.2%] of the 52 cases). Preoperatively,