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Comparative study between the visual outcome of phacoemulsification and small incision cataract surgery

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Abstract

Introduction

Cataract is still one of the most common causes of visual impairment worldwide. Phacoemulsification is the primary method for cataract surgery in developed countries. However, it is associated with high cost and small incision cataract surgery (SICS), which has become an alternative surgery for phacoemulsification, mostly in developing countries.

Patients and methods

This study was carried out aiming to compare the effectiveness [postoperative visual acuity (VA)] of phacoemulsification versus SICS. Four hundred and fifty cataract patients, allocated into two groups with no statistically significant differences in their basic characteristics, were included in the current study. Patients in the first group underwent phacoemulsification and those in the second group underwent SICS; patients were followed up for 28 days.

Results

This study revealed no statistically significant differences between the phacoemulsification and SICS groups in visual outcome or proportion of patients with normal vision at follow-up.

Furthermore, no statistically significant differences were found between both methods in the incidence of intraoperative or postoperative complications. The effectiveness of phacoemulsification and SICS in improving VA was found to be similar. SICS should be considered for more frequent use in high-volume mass cataract surgery.

Conclusion

In conclusion, SICS has comparable effectiveness with phacoemulsification in improving VA and should be considered in developing countries and rural areas.

Keywords: Cataract, phacoemulsification, small incision cataract surgery

INTRODUCTION

Although cataract is almost always a curable disease, it is still one of the most common causes of visual impairment worldwide and is one of the main ophthalmological public health problems in both developed and developing countries [1].

Furthermore, although rates are declining in many areas globally, the prevalence and absolute number of blind patients because of cataract remain high [2]. In 2010, one in three blind individuals was blind due to cataracts, and one in six visually impaired individuals had visual impairment due to cataracts [3]. Recent studies indicate that 36 million

individuals are blind worldwide, and over 12 million are due to cataracts [4]. The importance of cataract blindness is that more than 90% of the total disability-adjusted life years lost due to cataract are in developing countries [5].

According to the World Health Organization [6], Egypt has approximately 1 million blind individuals and three million

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visually impaired individuals, and nearly 60% of the visually impaired individuals in Egypt have a cataract.

Both small incision cataract surgery (SICS) and phacoemulsification have become popular and common cataract surgical techniques. Phacoemulsification is the primary method for cataract surgery in developed countries. However, phacoemulsification is associated with high cost and maintenance demands of the equipment. Therefore, significant efforts were made in developing countries to make cataract surgery more affordable [7]. The SICS has become an alternative surgery for phacoemulsification, mostly in developing countries. The SICS is a possible surgical technique in suboptimal conditions and serves to avoid phacoemulsification's high maintenance cost since it is faster and more cost-effective than phacoemulsification [8].

Several studies in Egypt found insignificant differences between uncorrected visual acuity (VA) results and best-corrected visual acuity (BCVA) of patients who underwent phacoemulsification versus SICS [8,9].

This study was carried out to compare the effectiveness (comparison of postoperative VA) of phacoemulsification versus SICS.

PATIENTS AND METHODS

Time frame

This study was carried out during the period from Jan 2017 to November 2020.

The study protocol received approval from the Institutional Review Board of our hospital. Administrative approval and official permissions were obtained before data collection. Informed written consent was obtained from patients included in the study following the guarantee of data confidentiality to them.

Study population

This study was carried out on 450 cataract patients who underwent cataract surgery at Sohag Teaching Hospital during 2017–2020.

Inclusion criteria

The inclusions criteria were as follows: cataract patients who had

- (1) mature and immature senile cataract (Burrato's grade 3–4 cataract opacity).
- (2) no systemic comorbidities.
- (3) who provided informed consent to be included in the study.

Patients were allocated into two groups:

- (1) Group A: 225 eyes, for which phacoemulsification was performed.
- (2) Group B: 225 eyes, for which SICS was performed.

Methods

Cases were assessed preoperatively. History taking included detailed medical history and detailed ocular history. A complete

ophthalmologic examination was performed, including BCVA using the Early Treatment Diabetic Retinopathy Study (ETDRS) charts. The diagnosis of cataract was made by slit-lamp biomicroscopy for anterior segment examination.

Phacoemulsification (performed for group A patients) is a cataract removal technique using an ultrasound-based machine and microsurgical instruments and involves a temporal 2.5–3.0 mm precise corneal incision, followed by a separate corneal port(s) [10]. Continuous curvilinear capsulorhexis (trypan blue-assisted capsulorhexis is frequently performed) is created, and then hydrodissection is performed below the anterior capsule rim [11].

The SICS is a technique of extracapsular extraction in which the cataract nucleus is prolapsed from the capsular bag (with Sinskey Hook or hydrodissection injection) and extracted through a 6–7 mm scleral tunnel by scope and dialer (sandwich technique) [12].

Both intraoperative and postoperative complications were recorded. Patients were followed up for 28 days postoperative with the reassessment of BCVA at the 28th day postoperative in the same way as the preoperative assessment.

Statistical analysis

Data were collected, revised, coded, tabulated, and analyzed using the Statistical Package for the Social Science (IBM SPSS) version 22. IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp. Results were expressed as mean and SD for numerical values and percentages and percentages for qualitative data. Independent-sample *t*-tests were used to compare the means of two independent groups and the χ^2 test was used to compare proportions. The confidence interval was set to 95%, and the margin of error accepted was set to 5%. Therefore, the *P* value was considered significant at the level of less than 0.05.

RESULTS

This study included 450 cataract patients, 238 males (52.9%) and 212 females (47.1%), allocated into two groups, with no statistically significant differences in age or sex between both groups.

Cataract was managed by phacoemulsification for group A patients and SICS for group B patients.

The present study revealed no statistically significant differences between both groups in the visual outcome (uncorrected visual acuity at D+28) or the proportion of patients with normal vision (Table 1).

The present study revealed that no statistically significant differences were found between both groups in the incidence of intraoperative (Table 2, Fig. 1) or postoperative complications (Table 3, Fig. 2).

DISCUSSION

Cataract surgery markedly improves patients' quality of life as well as their visual function [13]. Although phacoemulsification

Table 1: Visual acuity outcome in the two groups

	Phacoemulsification (group A)	mSICs (group B)	P (RR; 95% CI)
Visual acuity (logMAR), mean±SD			
Post-surgery (UCVA, D+28)	0.607±0.589 (~6/20)	0.707±0.615 (~6/30)	0.162
Normal vision (≥6/18) at D+28%	52.4	45.5	0.233 (0.897, 0.750-1.074)

CI, confidence interval; D+28, 28 days postsurgery; logMAR, log minimum angle of resolution; RR, relative risk; UCVA, uncorrected visual acuity.

Table 2: Incidence of intraoperative complications

	Phacoemulsification (group A) (n=225) [n (%)]	mSICS (group B) (n=225) [n (%)]	P
Pupil rhexis, dialysis and updrawn	2 (0.9)	5 (2.2)	0.101
Aphakia or PCR	124 (55.1)	135 (60.0)	
Nucleus drop	39 (17.3)	42 (18.7)	
IOL drop	59 (26.2)	39 (17.3)	
Hyphemia	1 (0.4)	4 (1.8)	

IOL, intraocular lens; PCR, posterior capsule rupture.

Table 3: Incidence of postoperative complications

	Phacoemulsification (group A) (n=225) [n (%)]	mSICS (group B) (n=225) [n (%)]	P
PCO	22 (9.8)	20 (8.9)	0.953
Persistent corneal edema	98 (43.6)	100 (44.4)	
Endophthalmitis	42 (18.7)	45 (20.0)	
IOL decentration	55 (24.4)	50 (22.2)	
Uveitis	8 (3.6)	10 (4.4)	

IOL, intraocular lens; PCO, posterior capsular opacification.

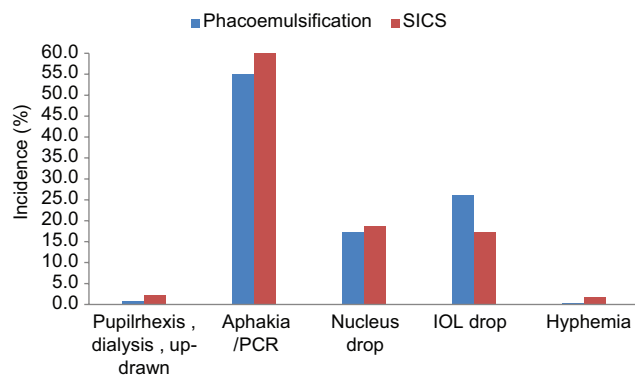


Figure 1: Incidence of intraoperative complications in the two groups.

is the preferred method for cataract surgery worldwide, it is not always available in developing countries [14]. SICS is another preferred option among surgeons that can be performed in rural and semiurban settings and eye-camps [15,16]. It is preferred in high-volume outreach camps, such as in low socioeconomic communities in the developing countries, due to its higher cost-effectiveness and comparable visual outcome as phacoemulsification while being non-machine dependent [16]. Devendra *et al.*[13] found that the average operative time in the phaco group was 16 min versus 10 min in the SICS group. Gogate *et al.*[15] showed that SICS's shorter duration decreases the backlog of cataract patients. They added that the cost needed to perform SICS was almost half as that needed for phacoemulsification, with more comfortable

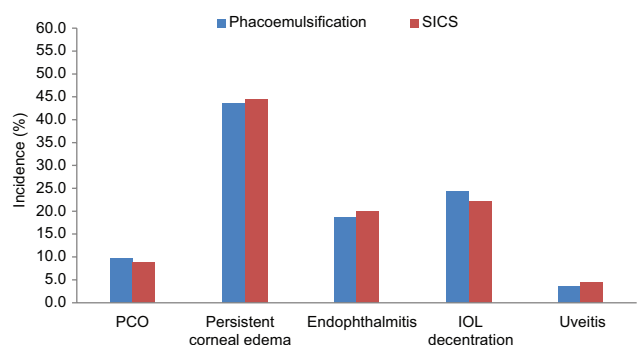


Figure 2: Incidence of postoperative complications in the two groups.

learning curves. Moreover, Singh *et al.*[17] showed that SICS sterilization procedures are more available and inexpensive when compared with phacoemulsification.

In a community services activity, it is more preferable to perform surgical options that are faster, more secure and yield an excellent visual outcome. One previous study revealed that in large numbers of cataract cases and limited resource settings, such as in Africa, SICS is a more preferred technique than phacoemulsification [9].

This study was carried out with the aim of comparing the effectiveness of phacoemulsification versus SICS.

This study included 450 cataract patients who were allocated into two groups with no statistically significant differences in

age or sex between both groups. This balance in the baseline characteristics provides the basis for comparison between the study groups as it helps to minimize bias [18].

The present study revealed no statistically significant differences between phacoemulsification and SICS groups in visual outcome or proportion of patients with normal vision at follow-up. Furthermore, no statistically significant differences were found between both methods in the incidence of intraoperative or postoperative complications.

Similar results were reported in a number of previous studies. Ruit *et al.*[19] compared the efficacy and visual results of phacoemulsification versus MSICS for the treatment of cataracts. They compared different parameters, including UCVA and BCVA. They found that both the surgical techniques achieved excellent visual outcomes with low complication rates. They also reported that the surgical time for SICS was much shorter than that for phacoemulsification, and they concluded that SICS is an appropriate surgical procedure for the treatment of advanced cataracts.

Ali *et al.*[20] reported that both techniques achieved excellent visual outcomes after three months of surgery, with no statistically significant difference of BCVA between both groups.

Moreover, Naik and Amrute[21] reported that both phacoemulsification and MSICS achieved comparable and excellent visual outcomes, with lower complication rates and earlier postoperative visual rehabilitation in MSICS.

Several limitations related to the study design and conduct are significant when interpreting these results. First of all, the BCVA examination was strongly influenced by the posterior segment's condition. Furthermore, the short follow-up period of 6 months cannot provide a complete evaluation of changes. This is why similar studies with more extended follow-up periods are needed to confirm the results of the present study.

CONCLUSION

In conclusion, SICS has comparable effectiveness as phacoemulsification in improving VA and should be considered in developing countries and rural areas.

Conflicts of interest

There are no conflicts of interest.

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