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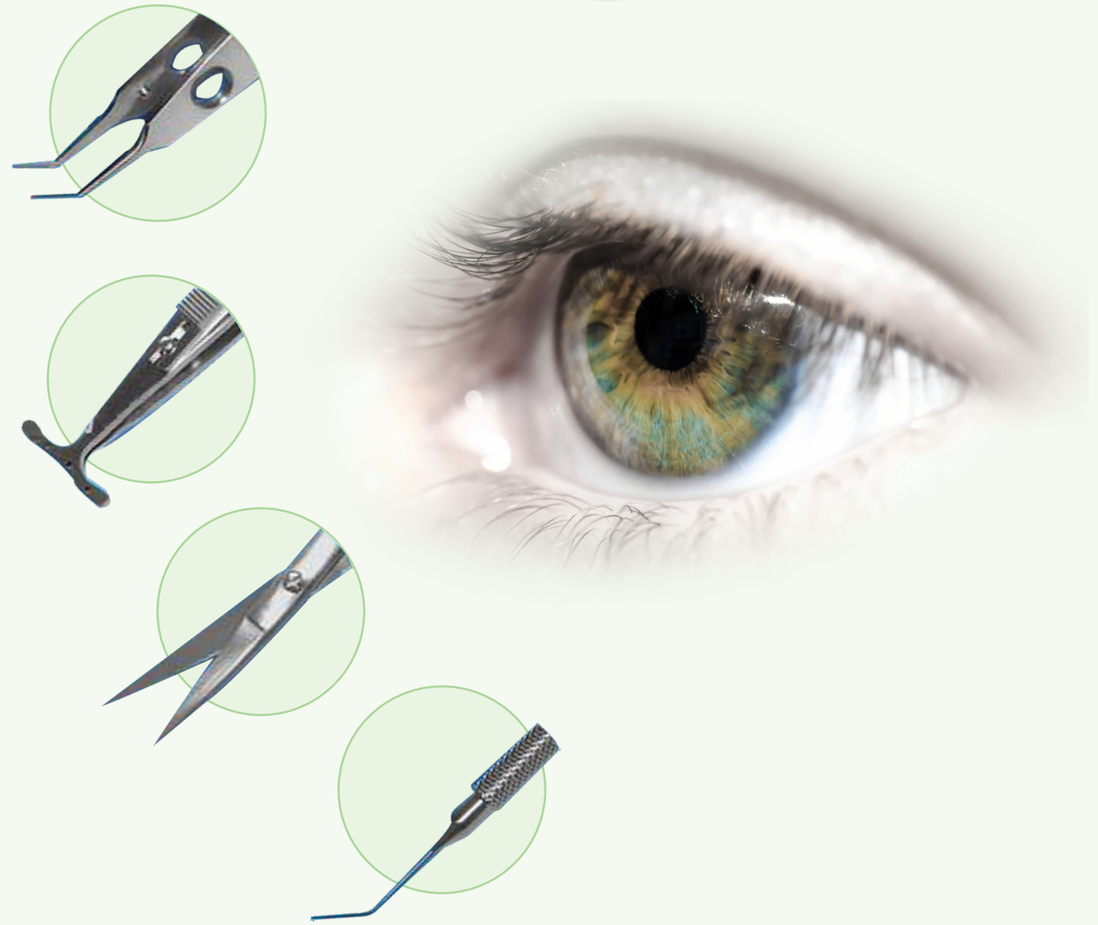
Surgical Insights



Complications of Phacoemulsification & Manual Small-Incision Cataract Surgery (SICS)

ISSUE - 3

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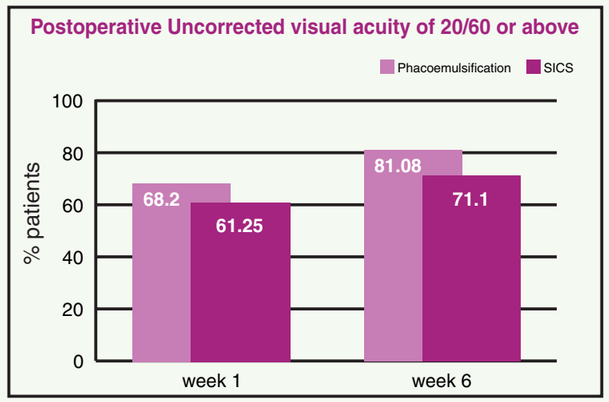
For a number of years, phacoemulsification has been the method of choice for cataract extraction in developed countries. Phacoemulsification can offer a safe and elegant disassembly and aspiration of the lens and a rapid recovery for patients.[1]

Phacoemulsification, however, is difficult to employ in high volume in developing countries as the technology requires costly machinery and consumables, a permanent and reliable source of electricity, regular maintenance, and specially trained surgeons and support staff. Phacoemulsification can also potentially lead to more serious complications when used to remove extremely dense cataracts commonly encountered in developing countries.[2]

Given these challenges, manual small-incision cataract surgery (SICS) has emerged as a cost-effective alternative to phacoemulsification in the developing world.[3] With suture-less manual SICS, the undivided nucleus is extracted and a poly (methyl methacrylate) (PMMA) intraocular lens (IOL) is implanted through a self-sealing scleral pocket incision. This technique is less expensive in terms of capital equipment investment, equipment maintenance, and disposable costs per case. In addition, it may be faster and better suited for the advanced and mature cataracts.[4]

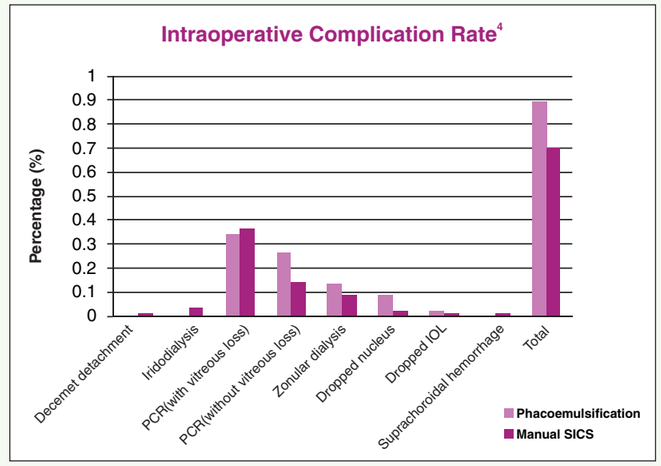
Phacoemulsification vs. Manual SICS

Gogate et al. compared phacoemulsification with manual SICS in a randomized controlled trial of 400 eyes in India and concluded that the **techniques were comparable in efficacy and safety**.



- Best corrected visual acuity of 20/60 or above at postoperative week 6 was achieved by 98.4% phacoemulsification vs. 98.4% SICS.
- **Complication rates were rare and similar between both the groups** & included posterior capsular opacity, iridodialysis and iritis.[2]
- Manual SICS was shown to be significantly faster than phacoemulsification. The average operative times plus turnover reported were 15 min 30s for phacoemulsification, and 8-9 minutes for manual SICS.[2]

A recent retrospective cohort series, carried out in Arvind Eye Hospital India, analysed the rate of intraoperative complications with phacoemulsification and manual SICS during a 12 month study period[4]. Results were as follows:



- Overall intraoperative complication rate: Phacoemulsification (1.11%), manual SICS (1.01%).[4] Posterior capsule rupture (PCR) was the most frequent complication accounting for two thirds (67%) of all complications where vitreous loss occurred in 72% of these eyes.
- **Manual SICS had a lower risk for complications than phacoemulsi fication among staff surgeons as well as trainees. However, overall outcomes were statistically better with phacoemulsification (96%) than with manual SICS (89%).[4] The findings suggested that compared with phacoemulsification, manual SICS is comparably safe for experienced surgeons as well as less experienced cataract surgeons.[4]**

However **another retrospective cohort series carried out in L. V. Prasad eye institute evaluated outcomes of SICS and phacoemulsification when performed by trainees.[5] The overall complications were seen more in the SICS group as compared with the phacoemulsification group (15.1% vs. 7.1%).** Although the complication rate was higher in the MSICS group, there was no difference in BCVA in both the groups.[5]

In a study of more than 42,000 consecutive cataract surgeries, the rate of infectious endophthalmitis was lower after phacoemulsification than after manual SICS.[3]

However, with SICS, there is more risk of astigmatism if the wound construction isn't properly done. There is also more risk of corneal oedema on the first postoperative day than with phacoemulsification. Posterior capsular opacification could be a greater risk in SICS than in the phacoemulsification. Iris injury is also slightly more common with SICS.[1]

Postoperative complications of manual SICS: Most of the postoperative complications with manual SICS are similar to those encountered with phacoemulsification.

- **Immediate complications**: Wound leak, corneal complications (DM stripping), corneal endothelial damage), postoperative iritis, postoperative IOP rise.
- **Late complications:** Corneal decompensation, uveitis, capsular bag complication, IOL malposition, PCO, CME, endophthalmitis.[6]

Management of Complications

A. INTRAOPERATIVE COMPLICATIONS

a. During Construction of a self-sealing wound:

Complication	Management
Premature entry: Dissection of the sclera is too deep and the anterior chamber (AC) is entered in the AC angle. The iris will easily prolapse and the wound will leak.[9]	A more shallow dissection can be started at the other end of the tunnel. Suturing of the wound is required at the end of the surgery.[9]
Button hole formation: Improper construction of scleral tunnel can lead to button holing, if tunnel is too shallow.[7]	Usually, this can be corrected by making a deeper frown-incision and dissecting the tunnel in a deeper plane, starting at the opposite side of the button hole[9].
Descemet's membrane injury or stripping: The keratome tip may be blunt or the angle at which the AC is entered may be too shallow.[9]	Injection of an air bubble /sulfur hexafluoride at the end of surgery usually results in reattachment of Descemet's membrane.[8,9] Viscoelastics may also be helpful to reattach Descemet's membrane.[8] Accidental removal of Descemet's membrane and overlying endothelium will result in irreversible corneal de compensation.

b. During opening of the anterior capsule:

Complication	Management
Linear capsulotomy: Rarely, an incomplete/oblique capsular tear will result, which makes mobilisation of the nucleus difficult.[9]	Extension of the capsulotomy with scissors solves the problem.[9]
Capsulorhexis: Peripheral extension of a capsulorhexis is the most common complication[9]	Anterior capsule staining and the use of capsule forceps (Utrata type) can reduce this risk. For a controlled rhexis, sufficient visco-elastic has to be injected to deepen the AC. The capsule flap should be gripped close to the advancing tear while pulling it centrally and slightly upwards. A failed capsulorhexis can be converted to a can-opener capsulotomy.[9]

c. During hydrodissection:

Complication	Management
Incomplete hydro dissection[9]	Hydro dissection is most effective if the fluid is injected directly under the capsule.[9]

d. During nucleus delivery:

Complication	Management
Small capsulorhexis: The nucleus cannot be tilted or prolapsed out of the capsular bag.[9]	The rhexis has to be enlarged by radial relaxing incisions.[9]
Small tunnel: Inadequate size of the tunnel will create unnecessary trauma during nucleus delivery.[9]	After mobilisation of a big nucleus, it is wise to re-check the size of the inner tunnel opening. If the wound seems to be small compared to the nucleus size, it should be enlarged before nucleus removal is attempted.[9]
Endothelial damage	In techniques where the nucleus is prolapsed into the AC before delivery, sufficient viscoelastic has to be injected above the nucleus to prevent endothelial touch.[9]
Iris trauma: Excessive manipulations may result in iris damage, prolapse or iridodialysis.[9]	Small, rigid pupils should be enlarged surgically by stretching iris retractors or a sector iridectomy, before nucleus delivery is started. Management options for iris prolapse: viscomydriasis and mechanical iris retraction with highly retentive OVDs, iris retractors, pupil expansion devices, and adjunctive pharmacologic agents. These include preoperative atropine, intraoperative epinephrine, or intracameral phenylephrine.[9]
Zonular dialysis: Risk of zonular dialysis is high after trauma in hyper mature cataracts and in pseudo-exfoliation syndrome.[9]	In small zonular dialysis, a PC IOL can still be implanted into the capsular bag or ciliary sulcus. However, in large dialysis, involving more than 6 clock hours, the capsule should be removed and an AC IOL implanted.[9]

e. Posterior capsule rupture (PCR): PCR may occur during hydrodissection, nucleus delivery or cleaning of cortex.[9]

Management: Once a PCR is noticed, irrigation should be stopped and vitreous integrity should be checked. If the anterior vitreous face is not disturbed, remaining lens cortex can be aspirated, using as little irrigation as possible. In case of any vitreous disturbance, anterior vitrectomy has to be done.[9]

B. COMMON POSTOPERATIVE COMPLICATIONS:

a. Post-operative corneal oedema:

Postoperative corneal oedema may occur for a variety of reasons. Toxic injury may occur to the endothelium from intraoperative medications, surgical trauma, detachment of Descemet's membrane, inflammation, low preoperative cell count, or the Brown-McLean syndrome. Treatment of postoperative corneal oedema can include hypertonic saline and topical anti-inflammatory therapy. If endothelial cell damage is so severe that corneal edema persists, then penetrating keratoplasty may be necessary.[9]

b. Posterior capsule opacification:

Standard treatment of PCO consists of opening capsule with Nd:YAG laser. Changes in surgical techniques, as well as adjunctive pharmacologic agents, may reduce incidence of posterior capsular. In opacification for congenital cataracts, primary posterior capsulectomy & anterior vitrectomy reduces its incidence[9].

c. Astigmatism:

Incision location, size & configuration all significantly affect surgical astigmatism. Astigmatism could be decreased by: decreasing incision size & adjusting suture depth, suture material & suture size. An incision that is posteriorly located is associated with less astigmatism than an anterior wound. A straight or frown-shaped incision has less astigmatism than a curved incision parallel to limbus. If intraoperative techniques are not successful, postoperative management can include the following[8]

- Clinical management: Spectacles, contact lenses
- Surgical management: Astigmatic keratotomy/Corneal relaxing incisions, Limbal relaxing incisions

d. Endophthalmitis:

The management strategy will then be directed according to the presenting visual acuity in the affected eye.

- When visual acuity is better than light perception: aqueous and vitreous samples should be obtained with both an aqueous tap and either a vitreous tap or a vitreous biopsy (with a cutting and aspiration probe).[10] Samples are sent for Gram stain, culture, and sensitivity. Empiric antibiotics are then administered, usually in the form of a single intravitreal injection of vancomycin and ceftazidime.[11] Patients should be closely followed up and if no clinical improvement is seen within 48 hours, a repeat injection might be warranted (although the risk of retinal toxicity should be considered).[12,11]
- In patients with light perception vision: 3-port pars plana vitrectomy should be done immediately because this regimen has demonstrated a 3-fold increase in the likelihood of 20/40 final acuity. Vitrectomy not only allows for collection of samples, but also has other benefits, including improvement of antibiotic distribution and reduction of infecting organisms, toxins, and opacities.[12,11]
- In diabetic patients: Greater likelihood of achieving a 20/40 acuity with vitrectomy (57%) than with a simple tap or biopsy (40%)[11]
- Antibiotics are administered at the time of surgery. The prognosis of PE is variable and depends on the type of organism isolated as well as the degree of inflammatory damage to the eye. Outcomes range from excellent visual acuity to blindness and even loss of the eye altogether.

CONCLUSION

Treating cataract blindness worldwide continues to be a formidable challenge. Significant barriers include cost, lack of population awareness, shortage of trained personnel and poor surgical outcomes. Both phacoemulsification and manual SICS achieves excellent visual outcomes with low complication rates, but manual SICS is significantly faster, less expensive and requires less technology. Therefore, manual SICS may be the preferred technique for cataract surgery in the developing world.[1]

Adapted from:

1. *Eyenet April 2009:43-47*
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3. *J Cataract Refract Surg 2010; 36:1849–1854*
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7. *Community Eye Health 2003; 16 (48):58-60.*
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NOTE

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Surgical Insights 1st Issue
Immediate sequential bilateral cataract surgery (ISBCS)

Summary :

Cataract extraction with intraocular lens (IOL) implantation is the most common surgical procedure worldwide. The frequency of second-eye surgery accounting for approximately 30% to 45% of all cataract extractions has increased.

Today, majority of surgeons perform delayed sequential bilateral cataract surgery (DSBCS), scheduling surgery in the two eyes approximately 4 to 6 weeks apart. An emerging trend, however, is to perform both surgeries on the same day. Immediate sequential bilateral cataract surgery (ISBCS) is being performed with increasing frequency worldwide and a number of surgeons believe this may be the future of cataract surgery.

This issue of surgical insights gives a brief update on the ISBCS indications, contraindications, guidelines for performing ISBCS, benefits and a look at the controversies with the use of ISBCS.

Surgical Insights 2nd Issue
Femtosecond Laser Cataract Surgery

Summary :

Cataract surgery has evolved tremendously since it was first performed. In 2010, the US Food and Drug Administration (FDA) approved femtosecond laser system for cataract surgery. This technology has the potential to significantly impact cataract surgery as the laser offers an opportunity to better meet patients' expectations.

This issue of surgical insight is an update on femtosecond laser cataract surgery wherein it gives an overview of the uses of femtosecond laser in cataract surgery, its benefits, and limitations and also mentions Indian experience of femtosecond laser cataract surgery.

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