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Many thanks to Drs. Allen Foster, Rengaraj Venkatesh, and Geoff Tabin for help in the slides
Each year, SEE conducts more than 200 sight-restoring programs in over 40 countries.
• A typical program lasts 5 days and provides 50-100 free surgeries to people without access to care.

• Patients are typically treated for cataracts, glaucoma, strabismus, and diabetic retinopathy.

• Clinics vary based on size of team, location, and types of cases.

• Require a host ophthalmologist at all of our sites for prescreening and post-op care.

• Medical supplies and equipment are donated by corporate sponsors & other SEE donors.
2017 PROGRAM LOCATIONS

Armenia
Bahamas
Bangladesh
Belize
Bolivia
Cambodia
Cameroon
Colombia
Costa Rica
Dem. Rep. Of Congo
Dominican Republic
Ecuador
El Salvador
Fiji
Ghana
Guatemala
Haiti
Honduras
India
Ivory Coast
Jamaica
Kenya
Laos
Liberia
Malawi
Marshall Islands
Mexico
Micronesia
Mongolia
Myanmar
Namibia
Nicaragua
Niger
Nigeria
Pakistan
Palau
Panama
Peru
Philippines
Sierra Leone
Swaziland
Tajikistan
Tanzania
Uganda
Vanuatu
Zambia
In 2017, we performed over 26,000 sight-restoring surgeries

In 2018, we performed over 40,000 sight-restoring surgeries

This year, we will restore sight to 100,000 people

Improving health worldwide

www.lshtm.ac.uk
- Patients are being connected with doctors based on their individual needs.

- Over 2,300 volunteer hours from ophthalmologists, optometrists, surgical technicians, and other volunteers.

- Eye exam clinic in Texas has examined over 100 patients in its three years, and we have extended the program to South Dakota, Colorado, and partnered with California CareForce to examine over 1,960 patients.
In order to ensure high quality care, we provide training for both our travelling ophthalmologists and in-country medical teams.

Our primary focus is on Manual Small Incision Cataract Surgery (MSICS) which allows doctors to perform cataract surgeries with self-healing incisions that facilitate a quick recovery.

Key training locations include Santa Barbara, New York, Philadelphia, London (UK), Kolkata (India), and Querétaro (Mexico).
**MSICS LEVEL I**

- A one day course involving a didactic lecture and wet-lab.

- Under the supervision of SEE Faculty, participants work with pig and human tissue.

- CME units available

**MSICS LEVEL II**

- Ideal for those who have already taken a Level I course and would like more hands-on experience.

- Work with experienced SEE Docs in these training courses.

- Current locations: Accra, Ghana; Kolkata and Siliguri, India; Querétaro, Mexico; Santo Domingo, Dominican Republic; and San Pedro Sula, Honduras.
Vision 2020 Links Program USA

• Program present in the UK since 2004 at the International Center of Eye Health
• Present in the USA since 2018
• First Links Project USA: Rwandan International Institute of Ophthalmology (RIIO) and Wills Eye Hospital
  • Institution to Institution relationship to improve training and patient care
  • 3 year program based on the Needs Assessment and a shared Action Plan
  • Visiting and cross training for a new residency program
    • Wills Online Education at RIIO
    • RIIO residents visit Wills Eye
    • Wills Eye fellows/attendings visit RIIO
# Definitions of Visual Loss and Advocacy: Translating WHO Grades of Vision into Real Life

<table>
<thead>
<tr>
<th>Grade</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blind: &lt;20/400</td>
<td>NLP Cannot see light</td>
<td></td>
</tr>
<tr>
<td>Severe VI: &lt;20/200</td>
<td>20/400</td>
<td></td>
</tr>
<tr>
<td>Mod VI: &lt;20/60</td>
<td>20/200</td>
<td></td>
</tr>
<tr>
<td>Normal: 20/20</td>
<td>20/60</td>
<td></td>
</tr>
</tbody>
</table>
Evidence of Success: Decrease in Prevalence by 25%

Number of Blind People / Million Population

WORLD

High Income Countries
Low Income Countries
Eastern Asia
South East Asia
Central and South ASIA
Sub-Saharan Africa
North Africa and Middle East

2015
1990

World
Higher Income
Asia
Africa
Evidence of Failure: Increase in actual number of blind (15%)
World population growth, 1750-2100

Annual growth rate of the world population

World population


Licensed under CC-BY-SA by the author Max Roser.
Where the Blind Are

80% of blindness and visual impairment is in those over the age of 50.
IAPB Vision Atlas: How well did we tell the future in 1990 looking forward to 2015?

<table>
<thead>
<tr>
<th></th>
<th>Blind</th>
<th>MSVI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual number in 1990</td>
<td>31m</td>
<td>160m</td>
</tr>
<tr>
<td>Number expected in 2015 if prevalence rates had remained the same as in 1990</td>
<td>57m</td>
<td>286m</td>
</tr>
<tr>
<td>Actual number in 2015</td>
<td>36m</td>
<td>217m</td>
</tr>
<tr>
<td>Difference in number of people expected to be blind or MSVI in 2015 compared with actual number in 2015</td>
<td>21m</td>
<td>69m</td>
</tr>
<tr>
<td>Total difference in number of Blind + MSVI expected compared with actual</td>
<td>90m</td>
<td></td>
</tr>
</tbody>
</table>

Thus, in the year 2015 there were some 21 million fewer people who were blind and 69 million fewer persons with MSVI than would have been expected – a total of 90 million fewer people experiencing visual impairment.
Global Blindness and Visual Impairment 2015

36 Million Blind = Population of Canada (0.5%)

253 million with Moderate to Severe Visual Impairment = 4/5 of the population of the USA (3%)
Etiology of blindness

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Millions blind</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cataract</td>
<td>12.6</td>
<td>35</td>
</tr>
<tr>
<td>Uncorrected Refractive Error</td>
<td>7.4</td>
<td>21</td>
</tr>
<tr>
<td>Glaucomas</td>
<td>3.0</td>
<td>8</td>
</tr>
<tr>
<td>ARMD</td>
<td>2.0</td>
<td>5</td>
</tr>
<tr>
<td>Corneal Opacity</td>
<td>1.3</td>
<td>4</td>
</tr>
<tr>
<td>Trachoma</td>
<td>0.4</td>
<td>1</td>
</tr>
<tr>
<td>Diabetic Retinopathy</td>
<td>0.4</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>8.9</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>36.0</td>
<td>100</td>
</tr>
</tbody>
</table>
## Etiology of Visual Impairment (20/70 to NLP)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Millions</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cataract</td>
<td>65</td>
<td>26</td>
</tr>
<tr>
<td>Uncorrected Refractive Error</td>
<td>124</td>
<td>49</td>
</tr>
<tr>
<td>Age Related Macula Degeneration</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Glaucomas</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Corneal Opacity</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Diabetic Retinopathy</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Trachoma</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>All Other causes</td>
<td>37</td>
<td>14</td>
</tr>
</tbody>
</table>
Blindness prevalence map- 90% of the world’s blind live in the developing world


WorldHealth Organization, [www.who.int/blindness/datamaps/blindness.jpg](http://www.who.int/blindness/datamaps/blindness.jpg)

What happens when someone in a family goes blind in LMIC

- Quality of Life
- Early death (3 months in some studies, decreases lifespan by 1/3)
- Increases all-cause & childhood mortality
- Less access to medical care
- Decrease in family income
- Increased rates of poverty
- Less education for the next generation
- Social isolation
- Anxiety/depression

Blindness → Poverty → Blindness
Quality of Life before and after Cataract Surgery

Before surgery

One year after surgery

Cataract Impact Study: Hannah Kuper, Sarah Polack
Global Inverse Care Law - Where the Blind Are vs Where the Health Care Workers Are

### WHO recommendations

<table>
<thead>
<tr>
<th>Eye Health Staff Per Million Population in Sub-Saharan Africa</th>
<th>Minimum required</th>
<th>Anglo 574m</th>
<th>Franco 281m</th>
<th>Luso 53m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ophthalmologists</td>
<td>4</td>
<td>2.4</td>
<td>2.1</td>
<td>1</td>
</tr>
<tr>
<td>Optometrists</td>
<td>10</td>
<td>13</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>Ophthalmic allied staff</td>
<td>10</td>
<td>7</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>
Number of Ophthalmologists per million population for the 191 countries for which data is available

Data correct as at 12th Oct 2017

© IAPB Vision Atlas
Number of Optometrists per million population for the 128 countries for which data is available

Data correct as at 12th Oct 2017
The treatment of visual impairment

253 million

Trachoma + Oncho’sis + Vit. A Def.
MDA and Primary Health Care

Cataract + Refractive Error
One time curative treatment

Glaucoma + Diabetic Retinopathy
Screening + long term treatment

ARMD + Other Causes
Many “specialist” causes

Increasing complexity + resource requirements
Challenges in Developing World by Dr. Rengaraj Venkatesh, Aravind Eye Care System

• Reducing the backlog of cataract
• Phaco machines are expensive to purchase & maintain
• Foldable IOL’s are cost-prohibitive
• Shortage of ophthalmologists
Cataract Blindness
What is Needed?

• Maximize surgeon productivity
• High volume, rapid surgery
• Effective for advanced cataracts
• Low complication rate
• Low cost (equipment, IOLs)
Aravind Eye Hospital Service Model

- Fee for service: 35% of patient care
- Free/Subsidized service: 65% of patient care
- Separate facilities for the paying and free patients

The patient chooses where to get his/her care. The care provided is of the same quality but the facilities provided are different based on the pricing.
Private vs Non-Paying at Aravind

$200-$500 for Phaco with foldable lens
Air conditioning
Private rooms
etc.

Vs

$15 for MSICS with rigid IOL
Patient Turnaround Time for MSICS

• Average patient turnover per surgeon per hour: 8 - 12 cases

• Total patient turnover per surgeon for 6 hours: 45 - 60 cases
### Table 1 – VLEG estimates for the global number of blind and MSVI persons – 1990 to 2050

<table>
<thead>
<tr>
<th>Year</th>
<th>MSVI</th>
<th>Blind</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>160</td>
<td>31</td>
<td>191</td>
</tr>
<tr>
<td>1995</td>
<td>168</td>
<td>31</td>
<td>199</td>
</tr>
<tr>
<td>2000</td>
<td>176</td>
<td>32</td>
<td>208</td>
</tr>
<tr>
<td>2005</td>
<td>186</td>
<td>33</td>
<td>219</td>
</tr>
<tr>
<td>2010</td>
<td>199</td>
<td>34</td>
<td>233</td>
</tr>
<tr>
<td>2015</td>
<td>217</td>
<td>36</td>
<td>253</td>
</tr>
<tr>
<td>2020</td>
<td>237</td>
<td>39</td>
<td>276</td>
</tr>
<tr>
<td>2050</td>
<td>588</td>
<td>115</td>
<td>703</td>
</tr>
</tbody>
</table>
Couching – Still the competition in many parts of the world
Main Challenges

1. Population increases and more elderly people with visual loss

2. More complexity for treatment of diseases such as glaucoma, ARMD, DR, etc., not a one time curative treatment like refractive error or cataract

3. Inequitable distribution of inadequate resources
Possible Solutions

1. Cataract services and spectacles can be financially self-sustaining

2. Non-doctors can be trained to do technical and surgical procedures

3. Mobile health and information technology can enable eye health staff

4. Increasing interest in global blindness
Online resources

• International Association for Prevention of Blindness
  https://iapb.org

• International Centre for Eye Health
  http://iceh.lshtm.ac.uk/

• Community Eye Health Journal
  http://iceh.lshtm.ac.uk/community-eye-health-journal/

• London School of Hygiene and Tropical Medicine Public Health for Eye Care
  https://www.lshtm.ac.uk/study/masters/public-health-eye-care

• World Health Organization
  http://www.who.int/blindness/en/
Evidence of SICS

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Many thanks to Dr. Allen Foster and Geoff Tabin for help in the slides
Literature categories

• Phacoemulsification vs. SICS
• Complication Rates
• Infection Rate
• Cost
• Visual Outcomes
Phacoemulsification vs. SICS

Safety and Efficacy of Phacoemulsification Compared with Manual Small-Incision Cataract Surgery by a Randomized Controlled Clinical Trial

Six-Week Results


- Masked randomized controlled clinical trial
- 400 eyes, 2 arms – phaco and MSICS
- Main outcome proportion of patients with visual acuity better to or equal to 20/60 at 6 weeks
- Phaco 81.08% vs MSICS 71.1% without spectacle correction (P=0.038)
- Phaco 98.4% and MSICS 98..4% with spectacle correction
- Astigmatism mode 0.5 D in phaco, 1.5 D in MSICS
Low Complications for Advanced Cataracts

Complication rates of phacoemulsification and manual small-incision cataract surgery at Aravind Eye Hospital

Aravind Hari priya, MD, David F. Chang, MD, Mascarenhas Reena, MS, Madhu Shekhar, MS

PURPOSE: To analyze the rate of intraoperative complications, reoperations, and endophthalmitis with phacoemulsification, manual small-incision cataract surgery (SICS), and large-incision extracapsular cataract extraction (ECCE).

SETTING: Aravind Eye Hospital, Madurai, India.

DESIGN: Retrospective cohort study.

METHODS: This study comprised consecutive cataract surgeries performed during a 12-month period. All surgical complications and endophthalmitis cases were tabulated and analyzed for each of 4 surgeon groups (staff, fellows, residents, visiting trainees). Within each surgeon group, complication rates with phacoemulsification, manual SICS, and ECCE were compared.

RESULTS: The surgical distribution was 20,448 (26%) phacoemulsification, 53,603 (67%) manual SICS, and 5,736 (7%) ECCE. The overall intraoperative complication rate was 0.79% for staff, 1.10% for fellows, 2.08% for residents, and 5% for visiting trainees. Extracapsular cataract extraction had the highest overall rate of surgical complications (2.6%). The overall complication rate was 1.01% for manual SICS and 1.11% for phacoemulsification. However, the combined complication rate for trainees was significantly higher with phacoemulsification (4.8%) than with manual SICS (1.46%) (P<.001). The corrected distance visual acuity was better than 6/12 in 96% after phacoemulsification complications and 89% after manual SICS complications (P<.001). There were 27 cases of endophthalmitis but no statistical differences between surgical methods or surgeon groups.

CONCLUSIONS: For staff surgeons experienced with both phacoemulsification and manual SICS, intraoperative complication rates were comparably low. However, for trainee surgeons, the complication rate was significantly higher with phacoemulsification, suggesting that manual SICS may be a safer initial procedure to learn for inexperienced cataract surgeons in the developing world.

Financial Disclosure: No author has a financial or proprietary interest in any material or method mentioned.


- Retrospective cohort study
- Analyzed rate of complications at Aravind Phaco, SICS, ECCE over 12 month period
- ECCE 2.6%
- Phaco 1.11%
- SICS 1.01%
- Endophthalmitis in 27 cases (0.04%) no difference in each group
- Trainees:
  - Phaco 4.8%
  - SICS 1.46%
Low Complications for Advanced Cataracts

- Retrospective audit over 3 years at UK training center
- 55 eyes
- Complication rate 1.8%
- 65% vision 20/40 or better with correction
- Post-operative astigmatism 1.40 D mean
Low Complications for Advanced Cataracts

- Nonrandomized interventional case series
- 33 patients with phacolytic glaucoma, all underwent SICS with trypan blue
- Mean pre-operative pressure 46.2
- 87.9% BCVA 20/60 or better
Low Complications for Advanced Cataracts

- Randomized prospective study at Aravind
- Compare the efficacy of phaco vs SICS for white cataracts
- 113 patients phaco; 117 SICS
- UCVA 20/60 or better 87.6% in phaco, 82.0% in SICS (P=0.1)
- BCVA 20/60 or better 99% phaco and 98.2% SICS (P=0.59)
- Posterior capsular rupture 2.2% phaco and 1.4% SICS (P=0.681)
Low, Equivalent Infection Rate

- Retrospective observational series at Aravind
- 42,426 consecutive cataract surgeries
- Standardized sterilization techniques
- Endophthalmitis rate 0.09% (38 total)
- 35 SICS and ECCE
- 3 Phaco (P=0.016)
- SICS/ECCE 3:1 to phaco
- Rate of endophthalmitis in underserved area similar to more modern areas of the world

Incidence of post-cataract endophthalmitis at Aravind Eye Hospital

Outcomes of more than 42,000 consecutive cases using standardized sterilization and prophylaxis protocols

Ravindran MS, Venkatesh DO, DNB, David F. Chang MD, Subhasish Sengupta DO, Jaryang Gyatso MS, Bodinath Talwar MS, DNB

PURPOSE: To report the incidence of postoperative endophthalmitis at a high-volume eye hospital in southern India using a modified cost-effective sterilization protocol.

SETTING: Aravind Eye Hospital and Post Graduate Institute of Ophthalmology, Pondicherry, India.

METHODS: In this retrospective observational series at a single eye hospital, records of patients who had cataract surgery were used to obtain a modified sterilization protocol from January 2007 through August 2008 and developed postoperative endophthalmitis within the first 3 postoperative months were drawn from a computerized database. The patients’ socioeconomic status, the surgeon’s experience, and the type of cataract procedure performed were analyzed as possible risk factors using the chi-square test/Fisher exact test.

RESULTS: During the study period, 42,426 cataract surgeries were performed. From these, 38 cases of presumed postoperative endophthalmitis were identified (incidence 0.09%). Thirty-five of the 38 cases were in the manual large- and small-incision extracapsular cataract extraction (ECCE) group, which had a statistically higher rate than the phacoemulsification group (P = .016). There was no statistically higher difference in the endophthalmitis rates between private patients and charity patients for either surgical method (manual ECCE vs phacoemulsification).

CONCLUSIONS: The modified sterilization and asepsis protocol adopted to facilitate high-volume cataract surgery in a clinical setting appeared to be safe and effective in preventing postoperative endophthalmitis. Despite a 3:1 ratio of manual ECCE to phacoemulsification and the elimination of certain traditional sterilization practices, the rate of endophthalmitis in this generally underserved patient population with multiple risk factors for infection was comparable to that reported in other modern settings.
Low, Equivalent Infection Rate

Endophthalmitis Reduction with Intracameral Moxifloxacin Prophylaxis
Analysis of 600,000 Surgeries

Amitrul Hariprasad, MD,1 David F. Chang, MD2 Razia D. Ravindran, MD2

Purpose: To compare the postoperative endophthalmitis rate before and after initiation of intracameral (IC) moxifloxacin prophylaxis for both phacoemulsification and sutureless, manual small-incision cataract surgery (M-SCS), as well as in patients with posterior capsular rupture (PCR).

Design: Retrospective, clinical registry.

Participants: All cataract surgeries (N=17,453) performed during the 29-month period from January 2014 to May 2016 at the 10 regional Aravind eye hospitals were included.

Methods: The electronic health record data for all study eyes were analyzed. Endophthalmitis rates before and after moxifloxacin were statistically compared for all eyes and separately for both phacoemulsification and M-SCS, and for the eyes complicated by PCR.

Main Outcome Measures: The postoperative endophthalmitis rates before and after initiation of IC moxifloxacin prophylaxis.

Results: Overall, 302,815 eyes did not receive IC moxifloxacin and 314,638 eyes did, and there was a significant decline in the endophthalmitis rate, from 0.07% (214/302815) to 0.02% (64/314638) (P < 0.001), with moxifloxacin. For the 194,262 phacoemulsification eyes, the endophthalmitis rate was 0.07% (75/104,264) without IC moxifloxacin prophylaxis, compared with 0.01% (11/189388) with moxifloxacin (P < 0.001). For the 44797 M-SCS eyes, the endophthalmitis rate was 0.07% (135/192149) without IC moxifloxacin prophylaxis, compared with 0.02% (22/222920) with moxifloxacin (P < 0.001). Approximately half of the 8479 eyes that had PCR received IC moxifloxacin, and half did not. Without IC moxifloxacin, PCR increased the endophthalmitis rate nearly 7-fold to 0.48% (20/4148); IC moxifloxacin reduced the endophthalmitis rate with PCR to 0.21% (9/4293) (P = 0.003). No adverse events were due to IC moxifloxacin.

Conclusions: Routine IC moxifloxacin prophylaxis reduced the overall endophthalmitis rate by 3.5-fold (3.9-fold for M-SCS and nearly 6-fold for phacoemulsification). There was also a statistical benefit for eyes complicated by PCR, and IC antibiotic prophylaxis should be strongly considered for this high-risk population. These conclusions are strengthened by the high volume of cases analyzed at a single hospital network over a comparatively short time frame. Considering the association of hemeorheologic occlusive retinal vasculitis with vancomycin and the commercial unavailability of IC ceftoroxime in many countries, moxifloxacin appears to be an effective option for surgeons electing IC antibiotic prophylaxis.

Opthalmology 2017;1–8 © 2017 by the American Academy of Ophthalmology

Supplemental material is available at www.aaojournal.org.
Low, Equivalent Infection Rate

- Case series at Aravind of all TASS cases over one year
- 60 TASS cases in 26,408 cataract surgeries
- 52% sporadic, rest were in 2 clusters
Low, Equivalent Infection Rate

Efficacy of Intracameral Moxifloxacin Endophthalmitis Prophylaxis at Aravind Eye Hospital

Arunvind Haripriya, MD,1 David F. Chang, MD,2 Sathvik Nambissan,1 Anand Srinivas, MS,1
Rosella D. Rasmussen, MD1

Purpose: To compare the rate of postoperative endophthalmitis before and after initiation of intracameral (IC) moxifloxacin for endophthalmitis prophylaxis in patients undergoing cataract surgery.

Design: Retrospective, clinical registry.

Participants: All charity and private patients (116,714 eyes) who underwent cataract surgery between February 15, 2014, and April 15, 2015, at the Madurai Aravind Eye Hospital were included. Group 1 consisted of 37,777 eyes of charity patients who did not receive IC moxifloxacin, group 2 consisted of 38,180 eyes of charity patients who received IC moxifloxacin prophylaxis, and group 3 consisted of 40,777 eyes of private patients who did not receive IC moxifloxacin.

Methods: The electronic health record data for each of the 3 groups were analyzed, and the postoperative endophthalmitis rates were statistically compared. The cost of endophthalmitis treatment (groups 1 and 2) and the cost of IC moxifloxacin prophylaxis (group 2) were calculated.

Main Outcome Measures: Postoperative endophthalmitis rate before and after initiation of IC moxifloxacin endophthalmitis treatment cost.

Results: Manual, sutureless, small incision cataract surgery (M-SICS) accounted for approximately all of the 75,697 cataract surgeries in the charity population (97%), but only a minority of the 40,777 private surgeries (21% M-SICS, 79% phacoemulsification). Thirty eyes in group 1 (0.08%) and 6 eyes in group 2 (0.02%) were diagnosed with postoperative endophthalmitis (p < 0.0001). The group 3 endophthalmitis rate was 0.07% (20 eyes), which

- Retrospective clinical registry
- Compare rate of endophthalmitis before and after intracameral moxifloxacin
- 116,714 eyes in 3 groups over 14 months
- Group 1 Charity patients without IC moxifloxacin
  - Endophthalmitis rate (0.08%)
- Group 2 Charity patients with IC moxifloxacin
  - Endophthalmitis rate (0.02%)
- Group 3 Private patients without IC moxifloxacin
  - Endophthalmitis rate (0.07%)
More Cost Effective

Cost comparison phaco vs SICS
- Fixed and recurrent costs (consumables) made and average calculated
  - Phaco $42.10
  - SICS $15.34
- Extra cost for phaco mainly foldable intraocular lens
- Also added cost due to phaco machine parts, maintenance, depreciation
- Authors prefer SICS due to similar outcomes and safety, lower cost
More Cost Effective

Estimate direct and indirect costs of MSICS, Phaco, ECCE at Aravind
• Both for hospital and patient
• Average provider’s cost
  • Phaco 25.55 USD
  • MSICS 17.03 USD
  • ECCE 16.25 USD
Excellent Outcomes

### Manual Small Incision Cataract Surgery: A Review

Renganath Venkatesh, MD,* David F. Chang, MD,† Radhakrishnan Muralikrishnan, MHM, MSc,‡ Kenia Hemal, MBBS,* Pariskshit Gogate, MS, FRCS (Edin),§ and Subhasachi Sen Gupta, DO, DNB

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**TABLE 1. Percentage of Post-Operative Visual Outcomes of Phaco and MSICS**

<table>
<thead>
<tr>
<th></th>
<th>UDVA</th>
<th>CDVA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Venkatesh et al²⁶</td>
<td>Gogate et al²⁷</td>
</tr>
<tr>
<td></td>
<td>(at 6 wk)</td>
<td>(at 6 wk)</td>
</tr>
<tr>
<td>Phaco</td>
<td>45.1</td>
<td>36.8</td>
</tr>
<tr>
<td>MSICS</td>
<td>36.4</td>
<td>31.6</td>
</tr>
<tr>
<td></td>
<td>Ruit et al²⁸</td>
<td></td>
</tr>
<tr>
<td>Phaco</td>
<td>53.7</td>
<td></td>
</tr>
<tr>
<td>MSICS</td>
<td>31.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Venkatesh et al²⁶</td>
<td>Gogate et al²⁷</td>
</tr>
<tr>
<td></td>
<td>(at 6 wk)</td>
<td>(at 6 wk)</td>
</tr>
<tr>
<td>Phaco</td>
<td>92.0</td>
<td>77.8</td>
</tr>
<tr>
<td>MSICS</td>
<td>83.8</td>
<td>85.6</td>
</tr>
<tr>
<td></td>
<td>Ruit et al²⁸</td>
<td></td>
</tr>
<tr>
<td>Phaco</td>
<td>94.4</td>
<td>72.8</td>
</tr>
<tr>
<td>MSICS</td>
<td>88.9</td>
<td>92.7</td>
</tr>
</tbody>
</table>

UDVA, uncorrected distance visual acuity; CDVA, corrected distance visual acuity.
TABLE 3. Surgically Induced Astigmatism of Phaco and MSICS (in Diopters)

<table>
<thead>
<tr>
<th>Study</th>
<th>At 6 wk</th>
<th>At 6 mo</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Phaco</td>
<td>MSICS</td>
</tr>
<tr>
<td>Venkatesh et al26</td>
<td>0.80</td>
<td>1.20</td>
</tr>
<tr>
<td>Gogate et al27</td>
<td>1.10</td>
<td>1.20</td>
</tr>
<tr>
<td>George et al33</td>
<td>0.77</td>
<td>1.17</td>
</tr>
<tr>
<td>Ruit et al28</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Muralikrishnan et al34</td>
<td>1.10</td>
<td>1.12</td>
</tr>
</tbody>
</table>

TABLE 4. Surgically Induced Astigmatism of MSICS According to the Type of Tunnel Constructed (in Diopters)

<table>
<thead>
<tr>
<th>Study</th>
<th>Follow-Up</th>
<th>Superior</th>
<th>Superotemporal</th>
<th>Temporal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venkatesh et al32</td>
<td>6 wk</td>
<td>1.08</td>
<td>—</td>
<td>0.72</td>
</tr>
<tr>
<td>Kimura et al35</td>
<td>6 wk</td>
<td>1.41</td>
<td>1.02</td>
<td>—</td>
</tr>
<tr>
<td>Gokhale and Sawhney12</td>
<td>12 wk</td>
<td>1.28</td>
<td>0.20</td>
<td>0.37</td>
</tr>
<tr>
<td>Reddy et al36</td>
<td>12 wk</td>
<td>1.92</td>
<td>—</td>
<td>1.57</td>
</tr>
</tbody>
</table>

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Excellent Outcomes

Manual Small Incision Cataract Surgery: A Review

Renganar Venkatesh, MD,* David F. Chang, MD;† Radhakrishnan Muralikrishnan‡, MHM, MSc;§
Kendra Hemal, MBBS,* Pariskshit Gogate, MS, FRCS (Edin);§ and Sabyasachi Sengupta, DO, DNB¶

TABLE 6. Mean Duration (in Minutes) of Phaco and MSICS

<table>
<thead>
<tr>
<th>Study</th>
<th>Phaco</th>
<th>MSICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruit et al28</td>
<td>15.5</td>
<td>9</td>
</tr>
<tr>
<td>Gogate et al42</td>
<td>15.5</td>
<td>8.5</td>
</tr>
<tr>
<td>Trivedy31</td>
<td>—</td>
<td>4.25</td>
</tr>
<tr>
<td>Venkatesh et al26</td>
<td>12.2</td>
<td>8.8</td>
</tr>
<tr>
<td>Venkatesh et al30</td>
<td>—</td>
<td>3.75</td>
</tr>
<tr>
<td>Balent et al43</td>
<td>—</td>
<td>4</td>
</tr>
</tbody>
</table>

Immediate postoperative complications occurred in 2% and 12% of

TABLE 7. Provider’s Cost in US Dollars of Phaco and MSICS

<table>
<thead>
<tr>
<th>Study</th>
<th>Phaco</th>
<th>MSICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muralikrishnan et al44</td>
<td>25.55</td>
<td>17.03</td>
</tr>
<tr>
<td>Gogate et al42</td>
<td>42.10</td>
<td>15.34</td>
</tr>
<tr>
<td>Ruit et al28</td>
<td>70</td>
<td>15</td>
</tr>
</tbody>
</table>

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www.apjo.org | 117
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Manual Small Incision Cataract Surgery

TABLE 5. Percentage of Intraoperative and Postoperative Complications Related to Phaco and MSICS

<table>
<thead>
<tr>
<th>Complications</th>
<th>Study</th>
<th>Phaco</th>
<th>MSICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCR</td>
<td>Venkatesh et al(^{26})</td>
<td>2.2</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>Gogate et al(^{27})</td>
<td>3.5</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Ruit et al(^{28})</td>
<td>1.85</td>
<td>6.0*</td>
</tr>
<tr>
<td>PCO at 6 mo</td>
<td>Ruit et al(^{28})</td>
<td>None</td>
<td>1+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>85.4</td>
<td>2+</td>
</tr>
<tr>
<td>Endothelial cell count</td>
<td>George et al(^{33})</td>
<td>4.21</td>
<td>5.41</td>
</tr>
</tbody>
</table>

LONDON SCHOOL of HYGIENE & TROPICAL MEDICINE
Excellent Outcomes

- Retrospective clinical registry in rural China
- SICS surgery performed on 313 patients
- 83.4% UCVA better than or equal to 20/60
- 95.7 BCVA better than or equal to 20/60
Excellent Outcomes

- Retrospective interventional study
- 368 eyes over 5 months
- UCVA 81.8% at 4th week
- 0.5% rate posterior capsular tear with vitreous loss
Meta-analysis

- 11 studies, 76,838 eyes
- No difference in UCVA and BCVA between phaco and SICS
- No difference in intraoperative or postoperative complications
- Phaco group had less astigmatism
Cochrane Analysis

- 1708 eyes with 8 trials
- BCVA at 6-8 weeks equal in 7 of 8 studies
- 3 studies (767/1708) showed UCVA better with phaco (95% CI 0.84 to 0.96)
- No difference in complications
- Conclusion: techniques are very similar, major advantage is cost (4:1)
Summary

• 12.6 million blind from cataract mainly in the developing world whose quality of life of themselves and their family suffer
  • This numbers are projected to increase (around 115 million)

• There are not enough eye care workers where they are needed the most

• Decrease in the quality of life due to blindness from cataract can be restored with successful surgery

• SICS is compared to phaco:
  • Less expensive (20 USD)
  • Faster (5 minutes)
  • Similar complication rates (1-2%)
  • BCVA similar (90-95% 20/60 or better)
  • A little worse in UCVA due to SIA (10-20% 20/60 or better) (0.75 D to 1.5 D)