

One step beyond tomorrow; Ranjan manual small-incision cataract surgery (MSICS) marker - Welcome to the topical, flapless and astigmatism-free MSICS era

Deepak Mishra, Nitish Dixit¹, Pratyush Ranjan²

The prevalence of blindness in India is 14.9 per 1000. Cataract causes 80% of this blindness. Most of these blinds are in the rural areas while the surgical service delivery channels are concentrated in the urban areas. This situation has many social impacts like loss of productivity, breakdown of interpersonal relationships, depressive manifestations, loss of self-esteem, and isolated humiliating life. Manual small-incision cataract surgery (MSICS; also SICS) is a low-cost, small-incision, high-valued cataract surgery that is principally employed in the developing world. In poor settings, MSICS also has several distinct advantages over phacoemulsification, including shorter operative time, less need for technology, and lower cost. Ranjan MSICS Marker is a tool which enables MSICS to be done under topical anesthesia easily with more precise and safe incision making along with more control on surgery induced astigmatism.

Key words: Astigmatism-free MSICS, Ranjan marker, Ranjan MM, topical MSICS

Access this article online

Website:

www.ijo.in

DOI:

10.4103/ijo.IJO_1696_22

Quick Response Code:



Cataract remains 51% cause of blindness and 33% cause of visible impairment internationally in accordance to information (2010) published by the World Health Organization (WHO). Ninety percent of these populations are currently in poorer parts of the world like southeast Asia and the region of Africa to the south of the Sahara desert, the places where fee stays a constraint for providing best treatment with satisfactory results.^[1]

In these communities, blindness is associated with significant incapacity and mortality. It also has profound societal and monetary ill effects via loss of productivity of both the blind patient and the care provider of that blind person. Because of the significant decrement in life expectancy and quality of life for the blind, sight restoration by cataract surgery is most likely one of the least expensive medical interventions with the best visual outcomes.^[2]

Phacoemulsification (phaco) is the surgical operation of choice for cataract in the developed world. Several researches have demonstrated quicker healing and better postoperative uncorrected visual acuity due to much less post-surgery astigmatism. Nevertheless, there are no considerable variations in visual rehabilitation, endothelial cell loss, and complication rates when in contrast with manual small-incision cataract surgery (MSICS).^[3,4]

Associate Professor, Department of Ophthalmology, Regional Institute of Ophthalmology, Institute of Medical Sciences, Banaras Hindu University, Varanasi, ¹Phaco-Refractive Fellow, ²Consultant Cataract, Refractive and Glaucoma Services, Medical Director at ASG Superspecialty Eye Hospital, Varanasi, Uttar Pradesh, India

Correspondence to: Dr. Nitish Dixit, Phaco-Refractive Fellow, ASG Superspecialty Eye Hospital, Ground Floor, Corporate Plaza, Near A.G.R Automobile, Rathyatra-Mahmoorganj Road, Gopal Vihar Colony, Mahmoorganj, Varanasi - 221 010, Uttar Pradesh, India. E-mail: drnitishdixit@gmail.com

Received: 14-Aug-2022

Revision: 02-Sep-2022

Accepted: 16-Sep-2022

Published: 25-Oct-2022

Phaco is often on hands in the developing world to those cataract patients who can privately fund it. Compared with MSICS, phaco requires a sizable capital purchase and higher grant charges per case.^[5] Annual phaco machine maintenance is an issue not only of cost but additionally of readily available qualified technical support. Moreover, there is a longer studying curve for new cataract surgeons to master phaco, which is specially challenging in the developing world due to poorer institutional and infrastructural support and lesser hands-on training for ophthalmologists.^[6]

Finally, the advanced mature cataracts and brunescant hard cataracts that are so regular amongst poor populations are extra challenging to extract with phaco, and the complication rate is greater in most arms except in most skilled and experienced phaco surgeons. Multiple studies have reported the safety and efficacy of MSICS for tricky cases, such as brunescant or white cataracts, and cataracts associated with phacolytic and phacomorphic glaucoma.^[7,8]

For these reasons, MSICS has emerged as a workable and preferable choice for many such settings. For high-volume cataract treatment with high and comparable quality, the use of MSICS has been popularized in community eye care facilities to efficaciously manipulate and treat the large backlog of cataract-associated blindness. It presents great outcomes at a fraction of the cost of phaco and with shorter surgical time.^[9]

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

Cite this article as: Mishra D, Dixit N, Ranjan P. One step beyond tomorrow; Ranjan manual small-incision cataract surgery (MSICS) marker - Welcome to the topical, flapless and astigmatism-free MSICS era. Indian J Ophthalmol 2022;70:4086-8.

When price is not the constraint, phaco frequently remains the procedure of choice for cataract extraction because of the following three reasons:

1. Shorter Hospital stays due to topical (drop) anesthesia;
2. Shorter recuperation time due to smaller measurements of incision; and
3. Lesser requirements of glasses/spectacles after surgery due to smaller size of wound creation and cautious wound development, taking account of steep axis and surgically induced astigmatism (SIA).

Topical MSICS is being carried out by many specialists around the world with notable results. MSICS with greater astigmatic control (comparable to phaco) is seen with carefully locating, shaping, and dimensioning of the incision.

Many researches have established the ideal MSICS incision to be of the following attributes: The anterior restriction of the incision should be 2–3 mm back to the limbus, in Koch's incisional funnel, to minimize post -surgical operation astigmatism. The size of the incision (the distance between the two ends but not along the curvature) varies from 5.5 to 6 mm. The frown-shaped incision is best suited for MSICS due to the fact that it induces the least astigmatism with much less tendency of wound area separation compared to the chevron incision.^[10]

Innovation

Ranjan MSICS Marker (RMM) (manufactured and marketed by EPSILON; USA) is designed to make topical flapless MSICS

with higher astigmatic control a reality for beginners and mid-level cataract surgeons [Fig. 1a].

It is designed to help in three critical steps of MSICS through its three specific components:

1. The 360° serrated edges at the base: It fixes the globe during tunnel making, obviating the need for optimal superior rectus bridle suture, obviating the want for peribulbar block, and putting up eye bandage after surgery [Fig. 1b].
2. Tunnel marker: It helps create a perfect frown-shaped 6-mm incision, 2 mm away from the limbus. The measured location, size, and shape of the incision will help surgeons reproduce their results [Fig. 1c].
3. Corneal axis marker: It helps in planning the incision on a steeper axis, taking care of pre-existing astigmatism.

It is important to understand that this tool has been made by keeping normal anatomical values of the eye in mind. The tool acts both like a pair of globe fixation forceps (eliminating the need for taking SR bridle suture) and a stencil (for creating the perfect size of the tunnel at the perfect place). No extra or additive pressure is applied on the globe while operating with RMM.

The functioning of RMM

The tunnel and corneal axis marker reduces post-surgery astigmatism by placing the least astigmatic incision in Koch's astigmatic funnel on the steep angle, taking care of both pre-existing and surgically induced astigmatism.

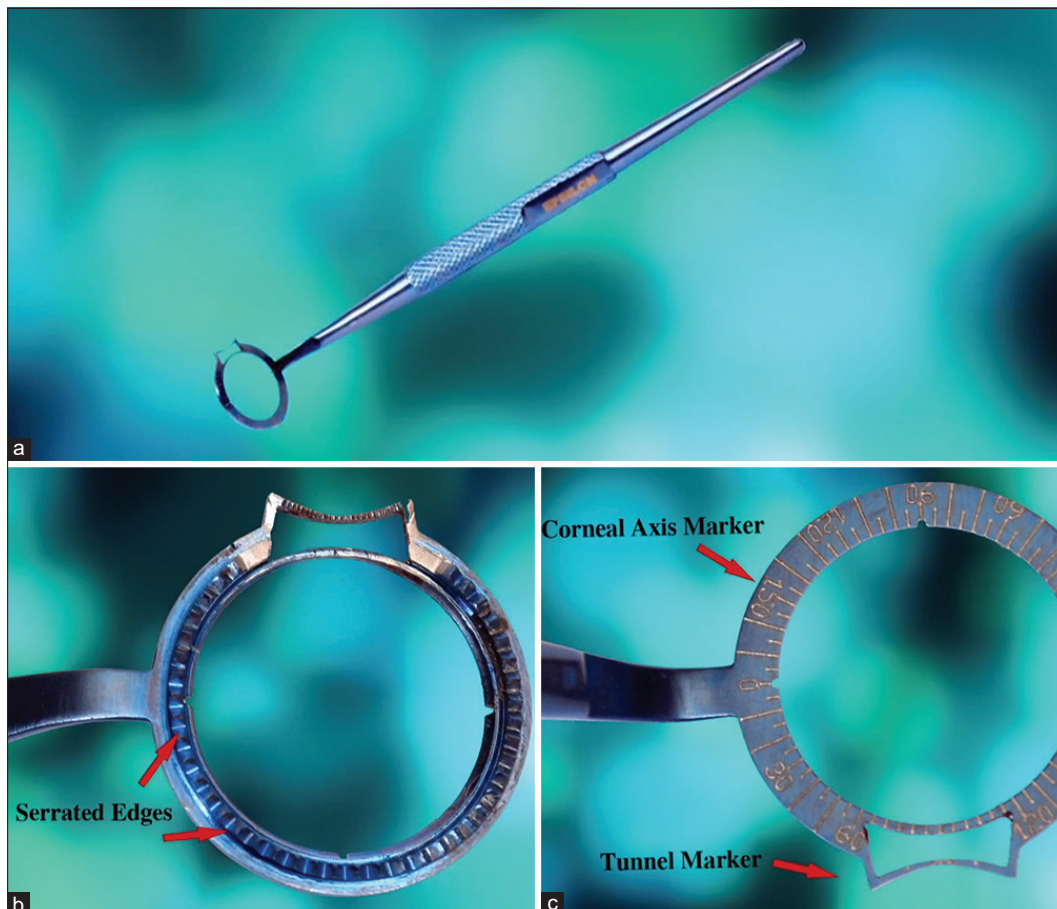


Figure 1: (a) The Ranjan MSICS marker. (b) Undersurface of the marker with 360° serrated edges. (c) Corneal axis marker with tunnel marker

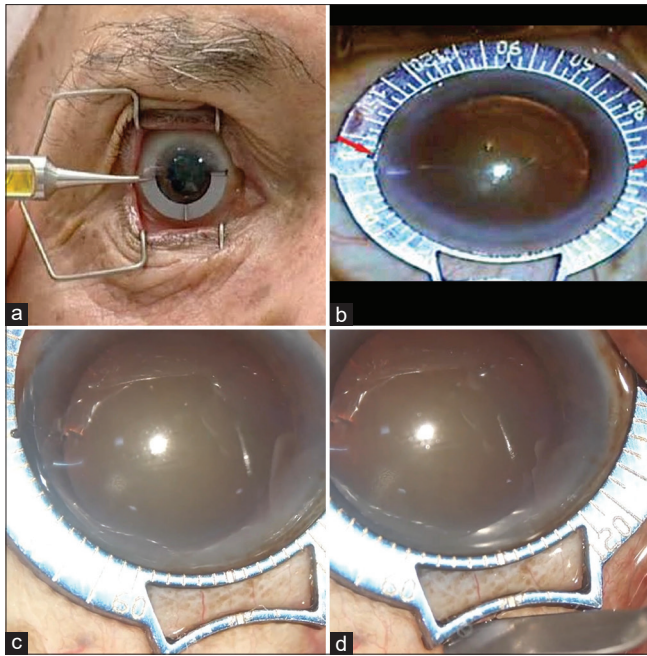


Figure 2: (a) Bubble marking. (b) Marking of steep meridian with the corneal axis marker. (c) Using the tunnel marker as a stencil. (d) Stabilization of globe by the RMM during surgery

The 0° and 180° meridian is marked with the use of bubble marker in the sitting position [Fig. 2a].

Using preoperative keratoscopic records (K1 and K2), the steep meridian of the affected person is identified. After draping is done, the corneal axis marker is then aligned with the pre-marked meridians on the patient's cornea and steep meridian is marked [Fig. 2b].

The RMM is then circled to align the tunnel marker axis to the steep axis of the cornea. A perfect frown-shaped incision of 6 mm length and 2 mm away from the limbus is created using the tunnel marker as a stencil [Fig. 2c].

The tunnel is created with the aid of stabilizing the globe by mildly pressing the RMM on the globe; the serrated edges at the undersurface affords exceptional grip, thereby obviating the need for toothed forceps or superior rectus bridle suture [Fig. 2d].

The beauty of this tool is that no extended skill or long learning curve is required as this instrument is just a guide to make tunnel and simultaneously act as an enhanced globe fixation forceps.

Discussion

The video explaining the use is available as a YouTube video titled "Ranjan MSICS Marker".^[11]

The flapless, topical MSICS is easily possible with the RMM as it reduces surgical procedure time, cost of the surgery, and hospital stay, and by this making blindness elimination more economical. The success depends to a great extent on the surgeon's preference and experience, and proper patient selection, counseling, and preparation. It is a safe alternative to the use of retro- or peribulbar injections, is less time-consuming and definitely less costly which has a measurable impact in high-volume settings and at the national level.

If the patient is less than cooperative in the clinical examination area, this behavior may be worse in the operating room and such a person is not suited for topical MSICS. It is also important to avoid this method in "office squeezers": patients who display a marked squeezing or muscular spasm during tonometry or indirect ophthalmoscopy. Young, anxious patients tend to fare worse with topical anesthesia as well. This method is also inappropriate in those who are markedly hard of hearing, are suffering from significant dementia, or are otherwise incommunicative. A wet lab is the fundamental ingredient of resident surgical training program as it provides a stress-free environment for the trainee to cultivate their surgical skills. The RMM can also be used on human donor/animal (goat/pig)/artificial eyes to practice SICS before operating on a real patient. A multicenter study comparing post-surgical astigmatism in topical phacoemulsification surgery with monofocal intraocular lens implantation versus topical R-MSICS using RMM is underway.

Conclusion

RMM enables MSICS to be done under topical anesthesia with a potentially precise and safe incision and control over surgery induced astigmatism.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. The World Health Organization. Causes of blindness and visual impairment. Available from: <http://www.who.int/blindness/causes/en/>. [Last accessed on 2017 Feb 5].
2. Venkatesh R, Chang DF, Muralikrishnan R, Hemal K, Gogate P, Sengupta S. Manual small incision cataract surgery: A review. *Asia Pac J Ophthalmol (Phila)* 2012;2:113-9.
3. Enany HA. Phacoemulsification versus manual small incision cataract surgery in hard nuclear cataracts. *Delta J Ophthalmol* 2018;19:92-8.
4. Gogate P, Optom JJB, Deshpande S, Naidoo K. Meta-analysis to compare the safety and efficacy of manual small incision cataract surgery and phacoemulsification. *Middle East Afr J Ophthalmol* 2015;22:362-9.
5. Gogate P, Deshpande M, Nirmalan PK. Why do phacoemulsification? Manual small-incision cataract surgery is almost as effective, but less expensive. *Ophthalmology* 2007;114:965-8.
6. Gogate P. Comparison of various techniques for cataract surgery, their efficacy, safety, and cost. *Oman J Ophthalmol* 2010;3:105-6.
7. Singh S, Pardhan S, Kulothungan V, Swaminathan G, Ravichandran JS, Ganesan S, *et al*. The prevalence and risk factors for cataract in rural and urban India. *Indian J Ophthalmol* 2019;67:477-83.
8. Gogate PM, Deshpande M, Wormald RP. Is manual small incision cataract surgery affordable in the developing countries? A cost comparison with extracapsular cataract extraction. *Br J Ophthalmol* 2003;87:843-6.
9. Muralikrishnan R, Venkatesh R, Prajna NV, Frick KD. Economic cost of cataract surgery procedures in an established eye care centre in Southern India. *Ophthalmic Epidemiol* 2004;11:369-80.
10. Haldipurkar SS, Shikari HT, Gokhale V. Wound construction in manual small incision cataract surgery. *Indian J Ophthalmol* 2009;57:9-13.
11. Smart MSICS with Ranjan MSICS marker. Available from: <https://www.youtube.com/watch?v=v1vYaMWinBY> [Last accessed 2022 Oct 12].