Surgical Technique

Fish hook technique for nucleus management in manual small-incision cataract surgery: An Overview

Abhishek Anand, Vivek Singh[1], Rashmi Kumari[2], Deepak Mishra[3], Rajesh R Kumar[4], Anil K Singh[5]

Manual small-incision cataract surgery (MSICS) preserves its utility as a cost-effective and efficient strategy for mitigating cataract-associated blindness. Numerous techniques of nucleus delivery in MSICS have been described in the literature. The fish hook technique of nucleus extraction was advocated in 1997 and has been popular for high-volume surgery in limited pockets of the world. This article describes in detail the steps involved in the construction of a fish hook, tips of nucleus extraction with the help of a fish hook, and the pros and cons of fish hook-based MSICS through text, diagram, and video supplement.

Key words: Cataract, fish hook, MSICS

Video available on:
www.ijo.in

Access this article online

Website:
www.ijo.in

DOI:
10.4103/ijo.IJO_1604_22

Quick Response Code:

With more than 8 million blind people and 62 million visually impaired, India shares almost a quarter of the entire global prevalence of blindness and visual impairment.[1] According to a survey conducted by The National Blindness and Visual Impairment Survey (2015-2019), cataract remains the leading cause of preventable blindness despite increased cataract surgical coverage with an average of more than 5,000 cataract surgeries per million population per year.[2] In developing countries such as India with a large aging population and cataract backlog, manual small-incision cataract surgery (MSICS) still maintains its relevance in the era of phacoemulsification and premium intraocular lens (IOL) s as a cost-effective and highly efficient strategy against mitigating cataract-associated blindness.[3]

Critical steps of MSICS are creating an astigmatically neutral sclero-corneal tunnel and nucleus extraction. Numerous techniques of nucleus delivery have evolved with modifications to optimize the final outcome. Common amongst these are anterior chamber (AC) maintainer (Blumenthal's technique), irrigating or non-irrigating wire-vectis, fish hook technique, hydroexpression, viscoexpression, phacosandwitch, phacosection, or phacofracture.[4]

Unlike other techniques of nucleus extraction, the fish hook technique is unique and minimally invasive, as it does not require prolapsing the nucleus into the anterior chamber. It is a highly efficient technique for extracting all grades of nucleus sclerosis even in suboptimal pupillary dilatation. Despite its advantages and proven workhorse since 1997, its popularity remains confined to Nepal and a few states of India.[5] We believe it to be due to a lack of sufficient literature and scarcely available training centers. To fill this lacuna, we did a thorough literature search in PubMed, Scopus, and Google Scholar and interviewed ophthalmologists practicing this technique to get an overview of this technique.

Surgical Technique

The fish hook technique was conceptualized, developed, and adopted in routine surgical practice for nucleus management in MSICS at Sagarmatha Chaudhary Eye Hospital Lahan, Nepal (SCEH), by Dr. Albrecht Hennig and colleagues around 1997.[5] SCEH performs around 50,000 cataract surgeries/year, a majority of them being MSICS with fish hook technique.[6]

Retinal Services, [1]Department of Ophthalmology, Regional Institute of Ophthalmology, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, [2]Department of Ophthalmology, All India Institute of Medical Sciences, Deoghar, Jharkhand, [3]Department of Ophthalmology, Regional Institute of Ophthalmology, IMS, Banaras Hindu University, Varanasi, Uttar Pradesh, [4]Department of Ophthalmology, Baba Baidynath Eye Hospital, Munger, Bihar, [5]Department of Ophthalmology, Ramganga Health, Moradabad, Uttar Pradesh, India

Correspondence to: Dr. Vivek Singh, Resident, Regional Institute of Ophthalmology, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India. E-mail: vivek05pmch@gmail.com

Received: 30-Jun-2022 Revision: 11-Aug-2022
Accepted: 28-Sep-2022 Published: 25-Oct-2022

Cite this article as: Anand A, Singh V, Kumari R, Mishra D, Kumar RR, Singh AK. Fish hook technique for nucleus management in manual small-incision cataract surgery: An Overview. Indian J Ophthalmol 2022;70:4067-9.

Prolapsing the nucleus into the anterior chamber with gradual clockwise or anticlockwise nudges on the lens nucleus equatorial plane using Sinskey hook or similar devices is the critical step in all methods of MSICS techniques.[3] The fish hook technique of MSICS bypasses this step.

Preparation of fish hook

The fish hook, a unique nucleus management tool, is prepared by bending a 30-gauge needle.[7] [Fig. 1a, Video 1]. It has double angulations, a terminal backward bend, and a lateral bend in the middle of the shaft. It occupies extremely less volume in the anterior chamber during nucleus extraction.

Capsular opening in fish hook technique of MSICS

The fish hook technique was initially developed for doing high-volume cataract surgery. Linear capsulotomy using a keratome knife was the usual practice. The advantage of linear capsulotomy was ease in the prolapse of the superior pole of the nucleus. Between the popped-out nuclear pole and the posterior capsule, viscoelastics would be used to create a safe plane for insertion of the fish hook. The nucleus is engaged ideally at the junction of the lower one-third and upper two-thirds before pulling it out of the bag and gradually out of the tunnel [Video 1]. Post IOL insertion, the large remnant of the anterior capsular flap would be fashioned into an adequate size capsular opening. However, due to asymmetric anterior capsular remnant in different zones of the capsular bag, there remains some possibility of some IOL decentration later on in capsular fibrosis. It could effectively be avoided by doing a continuous curvilinear capsulorhexis (CCC) of adequate size in proportion to the nucleus to facilitate its delivery without putting much pressure on the capsular bag.

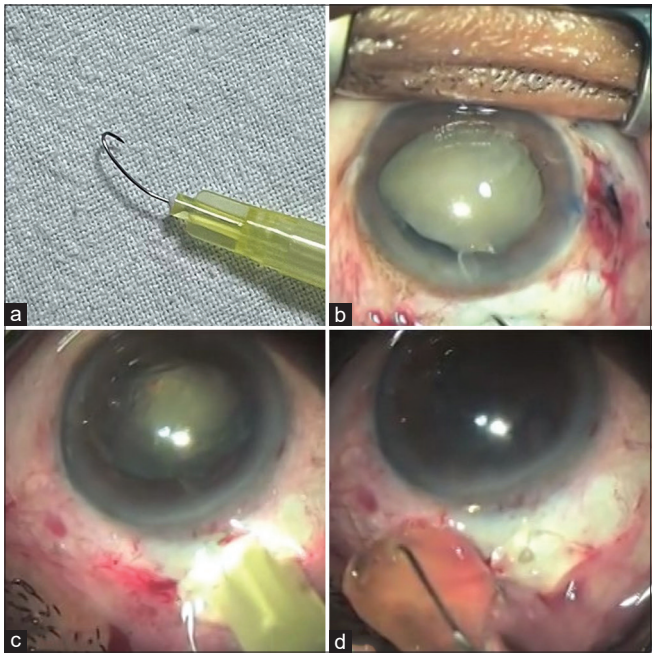

Figure 1: (a) Structure of fish hook. (b) Position of the fish hook during insertion through the tunnel. (c) Fish hook docking the nucleus (d) Hooked nucleus posterior aspect post extraction

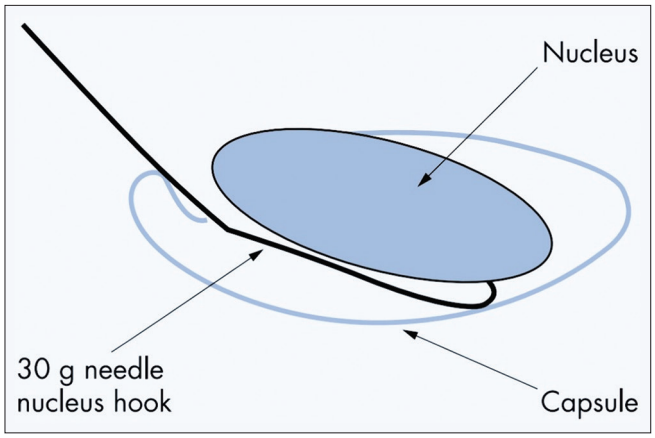

Figure 2: How nucleus is hooked by fish hook (Reference -Hennig A, Kumar J, Yorston D, Foster A. Sutureless cataract surgery with nucleus extraction: outcome of a prospective study in Nepal. Br J Ophthalmol 2003 Mar; 87(3):266-70. doi: 10.1136/bjo. 87.3.266.)

Nucleus delivery

Initially, the nucleus superior pole is prolapsed from the capsular bag. Once the superior pole of the nucleus can be visualized popping out of the capsular bag, a safe plane is created between the convex surface of the posterior nucleus surface and the concavity of the capsular bag with attached epinucleus and cortex by injecting viscoelastics. The fish hook is carefully introduced between this plane [Figs. 1b and 2; Video 1]. Near the inferior pole of the nucleus, the fish hook is slightly rotated upward for its effective engagement into the nucleus tip. Nucleus docking or hooking in the fish hook is necessary for effective transmission of pulling or delivery force for safe nucleus extraction. [Fig. 1c] Safe plane should be recreated by injecting viscoelastics in case of shallowing of the anterior chamber. Once the nucleus is hooked, it is glided out of the sclero-corneal tunnel using slight pressure on the posterior lip of the tunnel with a fish hook [Fig. 1d].

Like any force, the effective position of the nucleus and fish hook docking will determine the various forces. The ideal site for nucleus tip and hook engagement would be inferior to the horizontal meridian bisecting the nucleus and in line with the vertical meridian. If it is not in line with the vertical meridian, a torque vector might arise that might give a rotatory motion to the nucleus once engaged in the scleral tunnel. This might lead to the decoupling of the engaged hook and the nucleus and the hook will come out without complete nucleus extraction. The farther away the fish hook docking from the vertical midline, the stronger will be the rotating torque vector.

Ideally, the fish hook should have a right-sided curve if viewed from superiorly; so, it should be inserted from the left side of the scleral tunnel so that the tip effectively lies approximately in line with the vertical meridian [Video 1].

Advantages

Any size and type of nucleus can be delivered even in a minimally dilated pupil as the whole nucleus need not be prolapsed in AC [Video 1]. Intraoperative endothelial trauma is avoided as a safe cushion of viscoelastics is always maintained between the anterior nucleus surface and corneal endothelium. Repetitive trauma during nucleus prolapses into AC, and direct engagement of nucleus superior pole into the sclero-corneal tunnel further minimizes endothelial trauma. Surgical time is less when compared to other methods.[8]

Disadvantages

Cheese wiring of the nucleus can be encountered during the hooking of soft cataracts. In such cases, the fish hook is not actually hooked but it just directs the nucleus to glide over it and comes out of the tunnel. Prolapsing of the superior pole can be tricky in miosed pupil.[4,9]

One of the most dreaded complications is the engagement of the fish hook tip to any other intraocular structure. Fish hooking of the iris can lead to iris cut-through or iridodialysis. It is extremely difficult to disengage hooked iris tissue out of the fish hook, and extreme caution and lookout should be there to avoid this complication. It usually happens during a failed nucleus extraction and the nucleus is half engaged in the scleral tunnel. Other instances are when both superior and inferior poles have popped out and the 6-o'clock pupillary margin is caught between the lens and fish hook tip. Capsular dialysis and intracapsular cataract extraction (ICCE) are other dreaded complications in inadequately sized capsulorhexis.[4,5,9]

Discussion

Previously published literature has compared various nucleus delivery techniques of MSICS including the fish hook regarding their relative safety and efficacy. Sharma *et al*.,[4] in a prospective randomized interventional study, have concluded that the fish hook technique has limited utility in black cataracts. This can be due to improper hooking of the nucleus either due to a wrong assessment of the size of the nucleus or poor visibility of the hook with increasing density of the cataract when the procedure becomes entirely blind. However, with the increasing experience of the surgeon, this technique can be a boon for such cataracts as it demands very less space in the anterior chamber. Moreover, they also compared with other techniques of nucleus delivery and found that complications such as striate keratopathy, corneal edema, anterior chamber inflammatory response, retained cortical matter, secondary glaucoma, uveitis, hyphema, decentered IOL, irregular pupil, and hypotony were almost similar.[4] Another prospective study by Patil *et al*.[9] have documented the intraoperative complication rate with a fish hook to be as high as 57.58%. This probably could be due to the use of hooks made from 26 ½ gauze needles, which are thicker than the ideal fish hook. Also, most cases selected for this technique were of grade 1 or two cataracts, which are difficult to hook. On the contrary, an article by Hennig *et al*.[5] reported more than 3 lakh 40 thousand successful surgery, in which they reported a complication in 3.1% of cases during the first 100 surgeries in the hand of beginners. The same author also published an article in 2002 where they had done more than 2,000 surgeries with a complication rate of 1.2%.[8] Finally, the authors concluded that proper case selection according to the grade of cataract, pupillary dilatation, etc., is the deciding factor for selecting the technique of nucleus delivery, which we also believe to be true provided the surgeon has sufficient knowledge and expertise.

Conclusion

In comparison to other techniques of nucleus management, the fish hook technique is a safe, efficient, and cost-effective method of nucleus delivery in the MSICS method of cataract surgery, much useful in centers with high volume load. We suppose that this minireview will add to the knowledge of the fish hook technique to spread globally, which is at present restricted to a particular part of the world.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Stevens GA, White RA, Flaxman SR, Price H, Jonas JB, Keeffe J, *et al*. Global prevalence of vision impairment and blindness: Magnitude and temporal trends, 1990–2010. Ophthalmology 2013;120:2377–84.
2. Kumar A, Vashist P. Indian community eye care in 2020: Achievements and challenges. Indian J Ophthalmol 2020;68:291-3.
3. Thomas R, Kuriakose T, George R. Towards achieving small- incision cataract surgery 99.8% of the time. Indian J Ophthalmol 2000;48:145-51.
4. Sharma U, Sharma B, Kumar K, Kumar S. Evaluation of complications and visual outcome in various nucleus delivery techniques of manual small incision cataract surgery. Indian J Ophthalmol 2019;67:1073-8.
5. Hennig A. Nucleus management with Fishhook. Indian J Ophthalmol 2009;57:35-7.
6. Hennig A, Kumar J, Singh AK, Singh S, Gurung R, Foster A. World Sight Day and cataract blindness. Br J Ophthalmol 2002;86:830-1.
7. Sutureless Non-phaco cataract surgery: A solution to reduce worldwide cataract blindness? Community Eye Health 2003;16:49-51.
8. Hennig A, Kumar J, Yorston D, Foster A. Sutureless cataract surgery with nucleus extraction: Outcome of a prospective study in Nepal. Br J Ophthalmol 2003;87:266-70.
9. Patil MS, Balwir DN, Gupta A, Kataria I, Chatterjee S. A clinical study comparing different techniques of nucleus delivery in manual small incision cataract surgery. MVP J Med Sci 2015;2:67.