Surgical Technique

Snare assisted manual small-incision cataract surgery: Single solution for any grade of cataract

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Cataract surgery is constantly evolving with new techniques, machines, and procedures entering the lexicon. With the modernization, the cost of surgery is increasing with respect to the surgeon, patient, and the society. Early rehabilitation with modern minimal access techniques reduces the societal cost of intervention. Manual small-incision surgery is simple, safer, and cheaper when contrasted with the cost and steep learning curve of machine-driven surgeries. A nucleus of a normal size is 6 mm, which can be bisected; 3 mm longitudinal fragments can be removed through 3.5 to 4.5 mm incision, and a large nucleus of 9.0 mm can trisected and removed through 3.5 to 4.5 mm. The limbal tunnel incision is 3.5 mm, which is close to 2.8 mm phacoincision, so it gives all the advantages of modern phacosurgery. The search of an ideal technique for manual phaco-fragmentation leads us to this specially designed snare (designed by the first author AS) which can tackle any grade nucleus. The nucleus can be bisected or trisected with ease. The technique has been around for 2 decades. There is a small learning curve. The complications are few and can be minimized with practice and simulation. It is a safe, valid, repeatable, and generalizable surgical procedure.

Key words: Manual small-incision cataract surgery, snare

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Ophthalmic surgery has undergone significant changes in past 3 decades worldwide. Phaco-emulsification (PE) is being performed by ophthalmic surgeons worldwide, but the cost of surgery is high because of the cost of the phaco-machine and consumables. Manual small-incision cataract surgery (MSICS) emerged as the first choice alternative which retained most of the advantages of PE and could be delivered at a lower cost with equally high volumes.

Nucleus extraction in MSICS is basically classified into two groups, that is, total nucleus extraction or intra-ocular fragmentation of nucleus. The latter is used to reduce the MSICS incision size close to PE incision for early visual rehabilitation and better unaided vision. Incision sizes from 2 to 7 millimeters are used for MSICS now.[1,2] Among the techniques described for manual phaco-fragmentation, the snare can be used in all types: mature, black hyper-mature, morgagnian, traumatic, calcified, dislocated, colobamotous, and complicated cataract. Snare (wire loop) bisection or trisection has been around for several decades.[2,3]

The authors demonstrate use of Anil Shah's snare to bisect or trisect any grade of nucleus in the anterior chamber and remove through smaller incision up to 3.5 mm to 4.5 mm. The snare is made from disposable needles and steel wire.

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Making snare bisector

Two disposable 18 G needles, 36 G steel wire (Bingo Steel wire), emery stone, a pair of scissors, and a good-quality plier are required. We take an 18-G needle and rub its tip on an abrasive stone to make the tip blunt. On the side wall of the needle, at the tip, two small holes are made opposite to each other by rubbing the wall of the needle on the abrasive stone. A small dimple is seen on the wall of the needle. We perforate the dimple with another sharp needle to make the hole in the wall of the needle. This is performed on either side. About 9 inch of steel wire (36 G Bingo String Piano wire available at any departmental store) is taken, and both ends of the wire are passed through side hole opening of the needle. The wire passes through the lumen and comes out of the hub of the needle. A loop of about 13 to 15 mm size is formed at the blunt tip of the needle. Another 18 G needle is taken, and its tip is rubbed to make it blunt. The steel wire comes out of the hub of the needle, which is passed through the lumen of the 18 G blunt needle to form the handle of the snare. We fixate the steel wire into the wall of the 18 G needle by a pair of pliers. The technique was first described in 2003 and has been used ever since by different practitioners. The loop size can be made smaller or larger by pulling or pushing the handle of the

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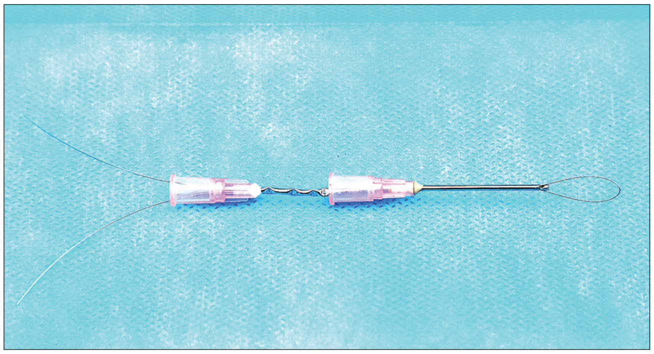

Figure 1: The Snare

needle. Rotation of the loop is possible by rotating the body of the needle. The loop size is made smaller by pulling the handle, and it can be made larger by pushing the handle of the snare.

The two holes at the tip of the snare is a magic concept. Because of side holes, the loop remains totally open while pushing and pulling the handle of the snare into the anterior chamber, and there is no loop tilting. The loop can be made smaller or larger depending on the size of the nucleus by pulling or pushing the handle of the snare. Vital intra-ocular structures such as endothelium, iris, or posterior capsule are to be avoided. Because of the two holes at the tip of the snare, rotation of the loop in to the anterior chamber is possible. When the body of the snare is rotated externally, the loop gets rotated internally without collapsing the anterior chamber or displacing the nucleus. Because of this, very easy over-riding of the loop is possible over the central part of the nucleus. The wire loop is very sharp so that it can easily divide the hardest nucleus. A thin wire passing through the large lumen of the needle gives a smooth movement of the loop into the anterior chamber [Fig. 1].

This snare can be used for all sizes of the pupil and all types of nuclei. The authors prefer not to use it for subluxated cataracts. It should also be avoided if the eye ball is hard, the nucleus is not dialed out and is not freely floating in the anterior chamber; the anterior chamber is not adequately filled with a visco-elastic; ocular movements are present; the anterior chamber is filled with saline, Ringer lactate, or balanced salt saline; and if the surgeon is not conversant with the use of a snare.

Sterilization of snare and re-use

Snare can be autoclaved many times and can be re-used till the wire loop breaks. After autoclaving many times, the wire loops lose tensile strength, become fragile, and break. The best way is to check it after autoclaving and before beginning the surgery. If the to and fro movement is smooth, then we continue to use it. If it is not smooth, then we use another one which is The broken loop and handle are discarded. The body with two side holes can be re-used to prepare a new snare as shown in the video. While doing bisection, very rarely we encountered a situation where the loop broke inside the anterior chamber without bisecting the nucleus. It does not damage any intra-ocular structures. All that is required is to take out the wire loop sheathed in the body. A simple wire break does not cause damage to the endothelium or the posterior capsule, but no manipulation should be attempted. An extra snare ready in the surgical set is always available, and we take the new one to proceed with the bisection of the nucleus.

Cleaning of snare

After multiple uses, the nuclear debris and visco-elastic start caking in the lumen of the needle of the snare between the needle lumen and the wire. To overcome this, we break the loop and remove wire to clean the body of the snare. A sharp needle can efficiently clean the debris from the front and side holes, and for cleaning the body of the snare, a syringe filled with saline does a good job.

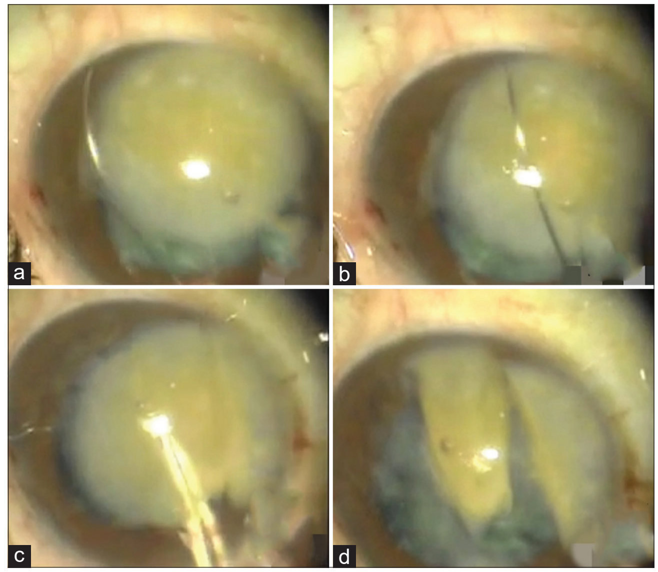

Figure 2: Snare in action. (a and b). Snare in action. (c and d). The nucleus after fragmentation (see the video attached)

On comparison of this snare to the Miloop,[4] the latter permits division of the nucleus in the bag without the need for prolapsing it into the anterior chamber. Miloop frequently tilts the distal end of the nucleus out of the bag into a somewhat vertical position if the nucleus is not soft. It is marketed as a single-use device, and its re-use is difficult as cleaning inside the shaft is a big challenge, even though people manage to re-use it.

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Surgery is performed under topical or peri-bulbar block according to the preference of the surgeon.

A fornix-based conjunctival flap is fashioned, and the bed minimally cauterized to stop bleeding if required. Gentle pressure with a Johnson bud is usually sufficient to staunch bleeding. We make a trans-conjunctival limbal tunnel incision 3.5 to 4.5 mm in length depending upon the size of the nucleus about 1 mm away from limbus with a side port blade or 2.8 crescent blade. The tunnel is made with a crescent blade. The crescent blade is moved side to side and forward till it crosses limbus to reach 1 mm into clear cornea. Then we make the internal incision extending it laterally on both sides in clear cornea. A 2.8 mm keratome blade is used to enter the anterior chamber, and the inner corneal incision is extended laterally. The side port entry is made at right angle to the tunnel incision with an MVR blade or 15 degree blade. After staining the capsule, the rehxis is performed using 26 G bent needle cystitome or Utrata forceps. Larger capsulorhexis has many advantages. The nucleus is easily brought into the anterior chamber, and surgery is made easier.

The aim of the hydro-procedure is to remove the smallest core embryonic nucleus. The size of the soft nucleus is about 4 to 6 mm, which after bisection is 2 to 3 mm for removal through the 3.5 mm incision. A hard nucleus is about 7 to 10 mm; after trisection, the hard nucleus is 3.0 to 3.5 mm, which easily comes out through 3.5 or 4.5 mm incision.

The authors prefer cortical cleaving hydro-dissection in multiple quadrants. This is natural cleavage, and it is performed to separate the cortex from the capsule. Hydro-delineation is performed using a 24 G cannula having a sharp bevel cannula (45-degree angle). We pass the pointed tip of the cannula into the substance of the nucleus until the resistance of the inner nucleus is felt indicating the point of separation of the soft outer nucleus and firm inner nucleus. At that point of resistance, we withdraw the cannula for a fraction of millimeter and inject the fluid. This creates the cleavage plane producing a circular "golden ring" around the inner nucleus. If the ring is not complete, we repeat maneuver at different areas and try to inject the fluid till the total ring is obtained. In hard cataracts, identification of cleavage is difficult as the outer portion of the nucleus may extend up to the capsule, whereas in soft cataracts, several cleavage planes may be seen.

We prolapse the nucleus into the anterior chamber using a 22 G cannula with the opening facing downward attached to the irrigating bottle. We pass the tip of the cannula under the capsule differently at 3 o' clock or 6 o' clock or 9 o' clock positions deep up to the equator. The fluid goes under the capsule behind the nucleus and with fluid pressure; it pushes the pole of the nucleus out of the capsular rim above the papillary border. The visco-elastic solution in between the cleavage of iris and nucleus is used after this, and the nucleus is dialed out using a Sinsky hook.

Nucleus fragmentation with snare

After injecting an adequate amount of visco-elastic between the endothelium and anterior surface of the nucleus, we continue injecting the visco-elastic solution to the sides and then beneath the nucleus to separate cortex and epinucleus and keep the anterior chamber deep. This gives an adequate amount of space for the movement of snare into the anterior chamber. We check the snare below the microscope and then introduce it into the AC.

Before using the snare, it is essential to ensure that the push and pull movement of the handle of the snare gives a smooth movement of the wire loop, re-shape the loop to an oval shape before using it, and get the loop to an appropriate size as a small loop will fail to engage the nucleus, whereas a large one can will damage intra-ocular structures. Going in with a sheathed loop and just adequate unsheathing allows the best combination of ease and safety. If the loop shape is irregular, then we discard that snare and use fresh snare.

Snare is used for bisection and trisection of any grade of nucleus as shown in Videos 1-3 as well as Fig. 2. We partly close the loop before passing it into the anterior chamber passing it obliquely in a slightly tilted position to the left side angle of the anterior chamber. One arm of the loop goes below the nucleus, and another arm goes above the nucleus. Then we shift the loop to the vertical position and simultaneously adjust the loop to the size of the nucleus by pushing the holder. When we rotate the hub of the needle externally, then because of its two side holes, the loop gets rotated internally into the anterior chamber until it encircles the body of the nucleus in the sagittal plane proper position. When the anterior loop engages the nucleus, it should be well away from the endothelium, and the posterior limb is also away from the posterior capsule if a cohesive visco-elastic is used in a soft shell technique. We engage the wire loop in the center of the nucleus and pull the wire loop handle posteriorly. This shortens the loop and cuts through the nucleus. The nucleus portions frequently adhere to each other like warm wax. We inject the visco-elastic in the groove of the nucleus to force them apart. For a large nucleus, trisection is performed after deepening the AC by injecting the visco-elastic all around the nucleus to make it free-floating. The nucleus is rotated obliquely. Now, a new snare is passed obliquely in the angle, and one-third of the nucleus is engaged to make another section.

Nucleus is visco-expressed for soft cataracts, and lens loop or vectis can also be used for nucleus extraction.[3,5,6] For hard nuclear fragments, the authors prefer McPherson forceps or Vectis or the phaco-sandwich technique.[1,6]

After the nucleus is removed, debris of epinucleus and the visco-elastic fills the anterior chamber. We inject bolus of the visco-elastic solution into the anterior chamber at 6 o' clock position and press the posterior lip of the wound with the cannula. This expels the remaining debris. Manual irrigation aspiration with a Simcoe cannula can be used to aspirate cortical matter.

Lens implant can be performed under a hydro-e or visco-elastic, cover and the lens is dialed into the bag.

The author (AS) has 20 years experience with this technique with more than 15,000 cases. There is a small learning curve. Complications encountered include inferior iridodialysis, transient corneal edema, and difficulty in prolapsing the nucleus. Posterior capsular rent was not seen in any case by AS in about 15,000 cases with this technique over the past 20 years, probably because while bisecting the nucleus, the loop constricts and is away from the posterior capsule and endothelium. However, studies from other centers will improve the generalizability of observations.

Conclusion

This is a safe procedure which can be practiced in any location as has been experienced over the past 20 years. This is a safe and repeatable technique.

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Conflicts of interest

There are no conflicts of interest.

References

1. Fry LL. The phacosandwich technique. In: Rozakis GW, editor. Cataract surgery: Alternative Small Incision Techniques. 1st ed. New Delhi: Jaypee Brothers; 1995. p. 71-110.
2. Kanas P. Phacofracture. In: Rozakis GW, editor. Cataract Surgery: Alternative Small Incision Techniques. 1st ed. New Delhi: Jaypee Brothers; 1995. p. 45-70.
3. Keener GT. The nucleus division technique for small incision cataract extraction. In: Rozakis GW, editor. Cataract Surgery: Alternative Small Incision Techniques. 1st ed. New Delhi: Jaypee Brothers; 1995. p. 91-163.
4. Ianchulev T, Chang D, Koo E, MacDonald S, Calvo E, Tyson F, *et al*. Microinterventional endocapsular nucleus disassembly: Novel technique and results of first-in-human randomised controlled study. Br J Ophthalmol 2018;103:176-80.
5. Singh K. Small incision cataract surgery (manual phaco). New Delhi: Jaypee-Highlights; 2010.
6. Singh K, Misbah A, Saluja P, Singh A. Review of manual small-incision cataract surgery. Indian J Ophthalmol 2017;65:1281.