

## Topical anaesthesia(vocal-focal) for small incision cataract surgery

Ram Lal Sharma<sup>1</sup>, Kalpana Sharma<sup>2\*</sup>

<sup>1</sup>Professor, <sup>2</sup>Senior Resident, Dept. of Ophthalmology, Indira Gandhi Medical College, Shimla, Himachal Pradesh

**\*Corresponding Author:**

Email: doctorkalpana.84@gmail.com

### Abstract

There has been a significant evolution in surgical technique of cataract extraction in last few decades. Likewise evolution of the anaesthesia has varied from general anaesthesia to regional blocks and now topical anaesthesia (TA). With the advent of phacoemulsification, cataract surgeries using TA has become a reality and routine. The advantages are many, for the patients as well as for the surgeon. Topical anaesthesia saves the patients from the risks of globe perforations, optic nerve injury, and life threatening respiratory arrest and above all, the pain and fear perceived because of the peribulbar or retrobulbar injections. If TA for phacoemulsification is safe in experienced hands, it should be safe for small incision cataract surgery (SICS). Although, it might require certain modifications in SICS like no superior rectus stitch, conjunctival flap or cautery. Therefore TA can be an effective option for modified SICS in suitable patients.

**Keywords:** Topical anaesthesia, Small incision cataract surgery

### Introduction

Topical anaesthesia for cataract surgery has the advantages of avoiding all the problems associated with the injections. These complications may not be common but if they happen are serious, namely haemorrhage, and globe perforation, optic nerve damage, neurological and cardiac problems.<sup>(1)</sup> In terms of surgical comfort, the complete anaesthesia and akinesia of eye ball achieved by injectable anaesthesia will be the standard of safety in variety of situations. The safety of topical anaesthesia is well established in selected patient for phacoemulsification in experienced hands, but SICS with intraocular lens implantation is also possible under topical anaesthesia in cooperative and uncomplicated cases.

### Anaesthesia for cataract surgery

Susruta Samhita describes the cataract surgery without any injections, but just by preoperative preparation of patient with medicated bath along with sedation, and concludes that patient will not have any pain during surgery.<sup>(2)</sup> Nobody could have believed him, in the era of injectable anaesthesia, when multiple injections with long blunt needle were a routine for ocular surgery. The invasive surgeries without injection as are increasingly being done today, endorsed this age old concept. But why one needs to move away from the comfort of akinesia of lids and eyeball? The answer is, to reduce the risk of visual and life threatening complications involved with injectable anaesthesia; as far as it is painless to the patient and comfortable for the surgeon. There is always a possibility of improvement in existing technique to make it better, safer and easier, and anaesthesia is no exception to it. One can eliminate the use of drugs and injections by cryoanalgesia<sup>(3)</sup> or by increasing the pain threshold.

Modern anaesthesia (contemporary) for cataract surgery started in 1884, when Karl Koller used cocaine drops topically and Herman Knapp used it for retrobulbar block.<sup>(4)</sup> In 1914, van Lint achieved orbicularis akinesia by local injection.<sup>(5)</sup> The complications of retrobulbar block in combination with facial block were sometimes threatening, so it went out of practice for routine surgery. The technique of peribulbar block was devised by Davis,<sup>(6)</sup> where orbicularis akinesia and globe anaesthesia was achieved by single injection, with less potential for ocular or neural complications. It is technically easier to place needle with this injection than retrobulbar, but more difficult to get a complete, dense block, and is still widely used, given its lower complication rate. Surface anaesthesia is achieved by putting drops in eye by different drugs, they produce conjunctival and corneal anaesthesia.

### Topical anaesthesia in SICS

Cataract surgery by phacoemulsification is frequently performed under topical anaesthesia,<sup>(6)</sup> although topical anesthetics are also known to cause allergy, endothelial and epithelial toxicity. The SICS has been under topical anaesthesia,<sup>(7,8)</sup> but needs to modify certain steps which are potentially painful by eliminating them. One can do SICS without superior rectus stitch, conjunctival flap or cautery, the minimal duration cataract surgery (MDCS).<sup>(9,10)</sup>

### Technique of surgery

**Direct stab incision:** After application of wire speculum, the stab incision is given directly with keratome just posterior to the limbus, like a clear corneal incision in phaco. The tip of keratome is slowly pushed through the limbal tissue and cornea with half thickness of the limbus or about 0.3 -0.4 mm. The position of stab

incision is oblique in supero-temporal quadrant in right eye and supero-nasal in left eye taking 10:30 clock hour of limbus as centre point. As there is more space available on the sides rather than at 12 o'clock limbus, so surgical manipulation is easier on sides in the absence of superior rectus suture.

The anterior limit of the tunnel is 1-2 mm in the clear cornea making a total width of tunnel from 2.5 -3.5 mm depending upon the desired length of incision keeping the length to breadth ratio of 2:1. The direct stab incision passes through different tissue strengths of limbus and cornea which makes it self-sealing. The tunnel is extended after capsular opening with 5.5 mm blade to the desired length of 6-8 mm. Care is taken while extending the tunnel, the extension blade is positioned straight in the stab and globe should be stable, so that external incision doesn't tear away.

**Capsular opening:** The capsule can be opened either by capsulotomy or by capsulorrhexis. The rhexis should be either larger in size or can be enlarged by giving relaxing cuts (2-3) on its margin with capsulotomy needle in the form of U shaped cuts (non-extending) or V cut at zonular insertion (extends as radial tear) with tip of the needle and side of needle respectively. The anterior radial tear prevents the stress on the zonules and facilitates delivery of nucleus during rotation in cases where cortico-nuclear mass is formed during hydro-procedures or in hard nuclei. But this radial tear does not affect the surgery rather facilitates sub-incision cortex removal and helps in pushing the upper haptic of rigid IOL in the bag. So an anterior radial tear can be a curse during phaco surgery but can turn up blessing in SICS.

**Self sealing tunnel:** The length of the self sealing incision varies from 6-6.5 mm for cortical cataract, and can be extended safely from 7 to 8 mm for brown and hard grade IV cataract. Tunnel can be extended prior to hydro-procedures so that softer nucleus is delivered in a single step as dissection, delineation and hydro-delivery. At the end of the surgery, 0.25 ml of sub-conjunctival dexamethasone and gentamicin is given; the ballooning closes the conjunctival incision.

**Prerequisites:** Patients undergoing surgery under TA should be counseled regarding the steps of surgery, and what they are expected to do during it, hence it has been also called vocal local anaesthesia. Patient needs to be relaxed and avoid closing their eyes, and avoid excessive motility. The eye opening capability of the patient should be assessed during application of the wire speculum. Patient should not be operated under TA, if he is NoTA patient

- Not following the command (N)
- Overreacting to pain (O)
- Too much movement (T)
- And squeezing of eyes (A)

**Procedure:** Preoperative preparation is similar to injectable anaesthesia including bath, light breakfast, oral sedation and acetazolamide tablet. Topical proparacaine drop or jelly 0.5% is instilled in the eye 10

minutes before surgery and another drop once the patient is positioned on the operating table. Intracameral preservative free 0.2 ml of 1% lignocaine is injected after entry into the anterior chamber. If the patient reacts to pain while making incision, focal sub-conjunctival infiltration of 0.1- 0.2 ml lignocaine can be given at the site of entry of incision (focal anaesthesia). Patients who express severe discomfort or who are excessively anxious in the beginning is given peribulbar block.

**Advantages:** The ideal anesthetic technique should produce an adequate level of analgesia for the proposed surgical procedure, inflict the minimum pain or toxicity on the patient and be performed easily. There are no injection related complications with TA and earlier mobility of patient due to retained blinking and ocular motility. To give topical anaesthesia no special skill or training is required; it is rapid, easy and free from major risk. It is also likely to be more acceptable to patients afraid of needles. There is no risk of damage to the globe or orbital contents and therefore topical anaesthesia is strongly indicated in the presence of large staphylococcal globes, scleritis, and a systemic or drug-associated bleeding tendency. Although absence of akinesia may increase the technical difficulty for the surgeon, but will avoid any transient postoperative diplopia experienced by the patient compared with any regional anesthetic block.<sup>(11,12,13,14)</sup>

### Limitations

Certain groups of patients are unfit for topical anaesthesia such as uncooperative, patients with communication problems, photophobic, rigid pupils, pseudoexfoliation and anticipated long surgeries (over 20 min).

### Discussion

Cataract surgery has gone through major evolutions throughout its history, from 'couching' to intra capsular, extra capsular, and now phacoemulsification. Though general anaesthesia (GA) is convenient for the patient and surgeon, but it subjects the patient to all the risks of GA, hiking cost and hospitalization. Regional anaesthesia has the advantage that it produces less post-operative restlessness, lung complications and less bleeding compared to general anaesthesia.

The retrobulbar injection supplemented by facial nerve block (O'Brien,<sup>(15)</sup> Atkinson,<sup>(16)</sup> Van Lint,<sup>(5)</sup> etc.) was the gold standard for many decades, but had the disadvantages of being a blind injection. Peribulbar injections avoided the need for facial block and minimized the incidence of optic nerve damage, but it was also a blind procedure. Whilst both the peribulbar and retrobulbar techniques are effective, there is a small risk of globe perforation (0.006%), retrobulbar hemorrhage (0.072 %) and damage to extra-ocular structures, optic atrophy, and central retinal vascular occlusion, cardiac arrhythmia, and brain-stem anaesthesia or death, have also been reported.

In 1986, Shimizu had demonstrated the use of topical cocaine (3%) in performing clear corneal cataract surgery,<sup>(17)</sup> although Koller<sup>(4)</sup> had introduced topical cocaine in 1884 but its toxicity limited its popularity. In 1992, Fichman presented a method for performing topical anaesthesia with tetracaine.<sup>(18)</sup> Many variations have been described by others since then. The topical anaesthesia is more of “vocal local” technique because the importance of constant communication with the patient during the procedure.<sup>(19)</sup> Some surgeons advise “rigid patient selection” for these procedures, and suggest that patients be well dilated to avoid the pain inherent in iris manipulation.<sup>(20)</sup> Another challenge is doing SICS on moving eye; if surgeon is experienced to do surgery under topical it is equally comfortable. The cataract surgery is done without superior rectus stitch, conjunctival flap or cautery similar to phaco-emulsification, the minimal duration cataract surgery (MDCS).<sup>(10)</sup>

Topical drops are able to anaesthetize conjunctiva, cornea and the area of incision in cataract surgery. There are an about 43thick nerve bundles at the limbus that innervate cornea, which are distributed evenly round the limbus.<sup>(21)</sup> By topical anesthetic these limbal nerves are blocked, so posterior limbal tunnel creation is mostly painless, while in some focal infiltration at incision site is required. Sub-conjunctival anaesthesia is a known entity for cataract surgery.<sup>(22)</sup>

Topical anesthetic agents block trigeminal nerve endings in the cornea and conjunctiva, leaving the intraocular structures in the anterior segment un-anesthetized. Thus, manipulation of the iris and stretching of the ciliary and zonular tissues during surgery can irritate the ciliary nerves, resulting in discomfort. To avoid this, one can give intracameral anaesthesia by injecting 0.5 ml of 1% lignocaine in AC after entry. It provides sensory blockage of the iris and ciliary body and relieves the discomfort during delivery of nucleus and intraocular lens placement.<sup>(23)</sup>

One should not simply modify or perhaps compromise (reduction in coaxial illumination, intracameral anesthetics) its surgical technique for whiter eye, without a patch and short term (1 day) improvement in the patient's quality of life. Is this goal worth the additional risk?<sup>(24)</sup> This is a question each of us must consider and answer. Because TA is inadequate for a longer, more complicated case and when attention of surgeon is most needed to manage an evolving problem, he has to go for additional anaesthesia. If the surgeon chooses to provide it by dropping more topical anesthetic on an open eye or, by infusing inside the eye a topical anesthetic that is neither formulated nor approved for intraocular use, the patient is being exposed to potential intraocular toxicity.

These questions stands as such for SICS under TA as they are for phaco. But TA is here to stay and by modifying some steps of SICS one can go ahead with surgery under TA in suitable patients and experienced

hands. We have done many cases of SICS under TA successfully, which is equally comfortable for surgeon and patient as it is phaco under topical. But a case control study is needed to prove its effectiveness and safety in terms of statistics.

## Conclusion

Topical anaesthesia can be an effective option for modified SICS (MDCS) with intraocular lens implantation in suitable patients. The complicated phaco surgery can be converted to SICS under TA provided the incision is not close to the cornea. However, the success depends to a great extent on surgeon's preference and experience. The proper patient's selection, counseling, and preparation are important. It is a safer alternative to the use of retro or peribulbar injections, which reduces time and cost of surgery.

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