

Organic Phacoemulsification

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Abstract: Aim: Phacoemulsification is a procedure of cataract extraction constantly under modification. Various drugs and chemicals, like local infiltration anesthesia, trypan blue dye and viscoelastic substances have been used concomitantly with the phacoemulsification procedure as a routine to provide for a smoother surgery. However, all these substances are associated with certain complication of their own. Peribulbar anesthesia has been known to be associated with ocular bleeding, ocular nerve trauma, ptosis, etc. Blue dye used for capsulorhexis can rarely be a source microbial infection. The ocular viscoelastic substances though very useful in maintaining the anterior chamber but is commonly noted to cause increased intraocular pressure and inflammation. Method: A comparative study was carried between conventional phacoemulsification and 'organic phacoemulsification' i.e. phacoemulsification surgery without using peribulbar anesthesia, trypan blue or ocular viscoelastic substances. The patients were regularly followed up and intra operative and post-operative complications were noted for both. Result: As compared with conventional phacoemulsification techniques, organic phacoemulsification was seen to be associated with lesser chance of complications like transient rise in IOP, stromal oedema, keratitis, cystoid macular oedema, etc. This was believed to be due to a combination of lesser intraoperative drug use, lesser surgical time and decreased post-operative medication requirement. Conclusion: Organic phacoemulsification proved to be a better technique than the orthodox technique.

Keywords: Phacoemulsification, modification, no OVD use

1. Introduction

Cataract is one of the leading causes of blindness in the world. (1) Cataract surgery is an ever evolving process, more so over the last fifteen years. It is a continuously and constantly revolutionising one, with changes in trends time to time. In view of these advancements, we are trying to further improve the result of cataract surgery and achieve early visual rehabilitation. With newer multifocal and toric lenses, patients demand has increased many folds. Cataract surgery is no more restricted to only the removal of cataractous lens and giving reasonable vision, but it also now aims to give good immediate post-operative vision. The process of cataract extraction has undergone revolution. The initial process of Intra Capsular Cataract Extraction (ICCE) evolved to Extra Capsular Cataract Extraction (ECCE) then Small Incision Cataract Surgery (SICS).

The ultrasound lens fragmentation was pioneered by Charles D.Kelman in 1987 (2) after being inspired by his dentist's ultrasound probe. However it took four years for this technique to be refined and be adopted by other surgeons worldwide. Now, phacoemulsification has become one of the gold standard procedures for cataract removal, but the technique of phacoemulsification is under constant scrutiny for further improvements. Along with the advancement of phacoemulsification, there have been advancements in the field of intraocular lens (IOL) industry as well as viscoelastic substances.

This study aims to bring to light a technique of phacoemulsification, termed as 'ORGANIC PHACOEMULSIFICATION', which minimizes the use of chemicals during surgery effectively reducing the complications, time and expenses involved with the same and provide immediate good post-operative vision.

2. Method

Objective

This study was carried out with the aim to note the benefits of using only Balanced Salt Solution (BSS) in phacoemulsification cataract surgery and avoiding the use of intra-cameral lidocaine, adrenaline, trypan blue and viscoelastic substance.

Study Subject

A total of 200 patients, ranged from 50 years to 80 years, with senile cataract who were assigned to undergo phacoemulsification surgery in a tertiary care hospital were taken. Institutional ethics committee clearance was taken prior to carrying out the research. Procedure was explained and prior written consent was taken in writing from all the patients. Subjects were divided into two age matched groups of cases and controls.

Materials and Surgical Technique

All the eyes were dilated preoperatively with tropicamide 1% and phenylephrine 5% eye drops. Proparacaine 0.5% eye drops topically were instilled three times over a period of thirty minutes. All surgeries were done by a single experienced surgeon.

Cases: Phacoemulsification cataract surgery was carried out as normal with the following modifications in the procedure:

- 1) A small side port incision was made, approximately 1mm in size, just allowing the irrigating cystotome to pass through. This ensured there is no wound leak through the sideport and helped in maintaining the anterior chamber without viscoelastic substances.
- 2) No dye was used for staining the anterior capsule
- 3) Irrigating cystotomy was performed
- 4) The closed chamber so formed helped in allowing IOL insertion without use of viscoelastic substances

Control: Phacoemulsification cataract surgery was carried out as normal without any modifications and with adequate use of viscoelastic substance, trypan blue dye

3. Result

The patients were followed up for a period of 1 year and post-operative complications were noted. Patients were followed up and evaluated for complications on day 1, day 7, day 30, 1 Month, 6 months and at the end of 1 year.

- 1) Transient rise in intraocular pressure
- 2) Striate keratitis
- 3) Stromal edema
- 4) Anterior chamber cells and flare
- 5) Posterior capsular opacification
- 6) Cystoid macular oedema
- 7) Post-operative fibrinous uveitis

After a systematic and exhaustive follow up, it was found that the incidence of complications in controls was higher than that in patients who underwent "organic phacoemulsification". The incidence of transient IOP rise was 22%, striate keratitis was 4%, stromal oedema was 3.5%, anterior chamber reaction was 2%, posterior capsular opacification was 23%, post-operative fibrinous uveitis was 0.5% and cystoid macular oedema was 14% in controls. The complication rate was reduced in cases who underwent 'organic phacoemulsification' with the incidence being 10% for transient IOP rise, 1% for stromal keratitis, 0.5% stromal oedema, 0.5% for anterior chamber reaction, 10% for posterior capsular opacification, 0.1% for post-operative fibrinous uveitis and 5% for cystoid macular oedema.

4. Discussion

A wide number of studies have been carried out, which have, in depth analysed the various techniques of phacoemulsification and associated complications.

Major intraoperative complications included posterior capsule tears with vitreous loss [1.4%], isolated posterior capsule tears [0.7%], and zonulysis [0.1%]. Minor complications involved anterior capsule tears [3.8%], iris prolapse [0.6%], and ciliary body incision [0.2%]. (3)

Post-operative complications usually comprised of striate keratitis [3%], stromal edema [3%], post-operative fibrinous uveitis [0.5%] in phacoemulsification. (4) Overall incidence of acute endophthalmitis was found to be 0.16% in Indian population. (5)

Peribulbar Vs Topical Anaesthesia

Peribulbar injections are a commonly used modality to create akinesia and anaesthesia. Even though it is equally safe and effective, there are still chances of vision threatening complications. These include ocular perforation, optic nerve trauma, orbital bleeding, extraocular muscle dysfunction, CRAO, CRVO, ptosis etc. Also the constituents of the block, including but not

limited to lignocaine, bupivacaine, hyaluronidase, etc have their own potential side effects.

The use of topical anaesthesia abolishes these risks and also provides the added advantages of being cheaper and having a quicker recovery time. Hence in the hands of a skilled surgeon, phacoemulsification can be effectively carried out under topical anaesthesia.

Viscoelastic Substances

The use of viscoelastic substances during phacoemulsification began in 1970s. However these viscoelastic substances have shown to cause a transient elevation in IOP post operatively. (6) The IOP rise normally happens within four to seven hours post operatively and though the rise is usually mild, it may even exceed 30 mm of Hg. The major cause of this IOP elevation is believed to be the blockage of trabecular meshwork by the viscoelastic substance which hampers the aqueous outflow. Though the IOP returns to baseline within few days, monitoring of ocular pressure and management of the same becomes necessary and troublesome in patients with already compromised ocular status.

Also, some believe, the use of viscoelastic substances increases anterior chamber inflammation. Toxic anterior segment syndrome (TASS), is a non-infectious inflammatory condition of the anterior segment of the eye that occurs due to contamination of the surgical equipment or supplies, viscoelastic being one such source. (7) Though rare, TASS can be potentially vision threatening and requires timely and aggressive treatment.

Even if all these complications are ignored due to the rarity of their incidence, complete removal of viscoelastic from the anterior chamber is necessary after IOL implantation. It is specially recommended with the newer multifocal and toric IOLs. Thus the use of viscoelastic and thereafter its removal increases the total duration of surgery and also adds up to the cost.

Hence, ophthalmologists from all over the globe have been trying to reduce the use of viscoelastic in their daily surgeries. (8)

Trypan Blue Dye

Trypan blue dye has been used since a very long time to improve the visualisation of the anterior capsule in various types of cataract surgery, especially in cases with poor red reflex from the fundus and mature cataracts. While considered relatively safe, studies are still being carried out to investigate various side effects of trypan blue dye.

In the year 2005, FDA reported that certain batches of trypan blue dye have been contaminated with *Pseudomonas aeruginosa*, which subsequently lead to vision threatening complications.

Prolonged use of this dye has also lead to occasional staining of the IOL, especially the hydrophilic lenses

which then become stained. Minor staining of posterior capsule and vitreous has also been noted. Teratogenicity has also been noted with the dye usage and further research work is being carried out.

Therefore to avoid all these complications, the process of dye less capsulorhexis is recommended as standard with the use of dye limited to the cases in which it is deemed necessary to.

5. Conclusion

The field of modern surgery is evolving at a daily basis with new technologies and newer methods being developed constantly. We, as healthcare providers should concentrate on providing the best treatment standards while avoiding complications.

Phacoemulsification surgery is one of the most commonly performed surgeries in the world. Surgeons have been putting it under a constant scanner to reform the surgery for better results. While various artificial drugs and chemicals have been developed to ease the process and avoid complications, these substances bring with them a baggage of their own complications. Hence a method of performing this phacoemulsification surgery with the use on minimum artificial chemicals has been suggested. The minimized use of artificial chemicals, gives this method its name 'ORGANIC PHACOEMULSIFICATION'. The method is easy to follow by an experienced surgeon and is found to be associated with decreased number of intra-operative and post-operative complications.

The following modifications in the standard phacoemulsification surgery have been proposed;

- 1) Use of topical anaesthesia instead of peribulbar or retrobulbar injections. This avoids injection related and drug related complications of the latter. Though akinesia is not achieved, the use of two ports provides the ability to adequately stabilize the globe and perform surgery.
- 2) To avoid use of viscoelastic substances throughout the surgery, which removes the chances viscoelastic related risks and effectively also reduces the surgery time and cost.
- 3) To avoid use of trypan blue dye to stain the anterior capsule
- 4) Practice of irrigating anterior capsulorhexis
- 5) IOL implantation and dialling without viscoelastic.
- 6) Use of Balanced Salt Solution (BSS) instead of Ringer Lactate (RL) for irrigation

The benefits observed were;

- 1) Anterior chamber inflammation leads to higher chances of posterior capsular opacification. Since there is decreased inflammation in this procedure, the chances of posterior capsular opacification are less
- 2) Early post-operative intraocular pressure rise was avoided because of no use of viscoelastic
- 3) Less surgical time
- 4) Block related side effects were avoided
- 5) Decreased consumable cost

- 6) Less use of topical steroids
- 7) Less use of IOP lowering agents
- 8) Early visual rehabilitation
- 9) Less number of post-operative visits
- 10) Less post-operative complications

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