Review Article

To Compare visual acuity and Surgically induced astigmatism after phacoemulsification by temporal clear corneal incision & superior clear corneal incision.

Abstract

Background- The primary goal of cataract extraction surgery is immediate visual recovery and the best uncorrected visual acuity (UCVA) post operatively. Aim: To compare the surgically induced astigmatism (SIA) after phacoemulsification surgery with superior clear corneal incision (SCCI) and temporal clear corneal incision (TCCI). Materials & method: 11 articles were reviewed on PubMed related to SIA & a review was made on the factors that are responsible to reduce the post-operative astigmatism. The outcome measures were SIA and UCVA at 2 and 6 weeks, post-operatively. Results - In this study we expect to have better visual outcome and reduce incidence of SIA in TCCI than SCCI. Conclusion: TCCI appears to have better visual outcome and reduced incidence of SIA.

Keywords- SIA, superior clear corneal incision, size of incision.

Introduction:

Cataracts have been a known cause of avoidable blindness for ages. The word cataract comes from the Latin word "cataracta," which means "waterfall," and is

named after the look of fast flowing water. Any opacity in the lens and or its capsule whether congenital developmental or acquired which cause visual impairment is known as cataract. Cataract is amongst the foremost reason of preventable impaired vision, the annual incidence being 3.8 millions[1]. Cataractous blindness leads to morbidity as well as economic burden. The present annual level of performance is approximately one point six to one point nine million cataract operations[1].

The permanent and the only cure for cataract is the cataract surgery. We've have evolved from couching in the ancient ages to microincision phacoemulsification surgery done in the modern world. All the cataract surgeries performed mainly aim to maximise unaided visual prognosis and early post-operative rehabilitation. MSICS (manual small incision cataract surgery) can into existence after phacoemulsification surgery. It's not that high-tech and also it's not used in the developed countries. Dr. Charles D. Kelman, an American Ophthalmologist & father of phacoemulsification surgery, invented phacoemulsification in the year 1967. A small incision made in perilimbal area or in the cornea allows for phacoemulsification probe to pass through, which uses ultrasonic vibrations to break down the crystalline lens nucleus.

Astigmatism can be defined as the type of refractive error in which the incident parallel rays of light coming from infinity does not focus on a single point on retina, instead they focus on two different meridian with accommodation at rest. SIA remains a common reason of poor postoperative visual consequence.

Over years there has been a tremendous improvement in cataract surgeries, beyond mere replacement of cataractous lens.

The main aim of any cataract surgery is early recovery & good post-operative visual outcome. The incision given during surgery causes changes in the curvature which leads to astigmatism, known as surgically induced

astigmatism.[2] Hence during surgery the surgeon also aims to correct the pre-existing astigmatism.[3]

Accurate pre-operative assessment helps in reducing the surgically induced astigmatism. SIA due to surgery can be affected by incision characteristics viz. size as well as incision's location.[4,5] The benefits of a clear corneal incision include enhanced safety, reduced inflammation and pain, and less SIA.

A through pre op evaluation of patient is very important for a surgeon to plan correction of the preexisting astigmatism, mainly by the size of incision & secondly by choosing the site of incision.

In this article we reviewed 9 articles wherein we analyzed the impact of incision & mode of surgery on SIA.

Materials & methods:

This is a systemic review wherein 11 articles by different authors globally were reviewed on PubMed related to SIA after phacoemulsification. All the findings of their research were put together and a review was made on the factors that are responsible to reduce the post-operative astigmatism.

All the factors were taken into consideration, i.e.:-

1. Site of incision
2. Size of incision
3. Type of incision
4. Pre-op existing astigmatism
5. Comfort of the surgeon
6. Post-op rate of infection
7. Type of surgery performed

Observation:

According to the surgery carried out by WHO cataract carries the major burden for preventable blindness in India. It is not only important to surgically remove the cataract but it also important to give a good visual outcome post-operatively. Overtime it has been observed that astigmatism in the most important cause of post-operative blurring of vision. Hence studies are being carried out all around the world to prevent surgically induced astigmatism and to reduced the pre-existing astigmatism.

Following are our observation after studying 11 articles by various authors globally.

Sitki et al's study on found no statistically significant difference in surgically induced astigmatism between superotemporal incisions in the right eyes and superonasal incisions in the left eyes 1 year after surgery for a surgeon sitting at 12 o'clock. In left eyes, superonasal clear corneal incisions (CCI) can be used, while superotemporal clear corneal incisions can be used in right eyes.[6]

According to Neeraj Sharma's research, when post-operative astigmatism in 5.2 mm TCCI for cataract surgery was evaluated, it was discovered that the mean astigmatism after one month was 1.02 D at 104 degrees.[7]

Another study, medically produced astigmatism following 3.0 mm temporal and nasal clear corneal incisions in bilateral cataract surgery by Je Hwan Yoon et al, found that the nasal incision had numerous potential drawbacks over the temporal incision in horizontal incisions. Phacoemulsification with a horizontal, CCI causes astigmatism of a greater magnitude in the left eye (nasal incision) than in the right eye (temporal incision). Preoperatively and postoperatively, SIA was similar between the temporal and nasal clear corneal incisions.[8]

Simsek et al. published a study called "Effect of SCCI and TCCI on astigmatism after phacoemulsification," which revealed that upper lid pressure on SCCI

caused fluctuating, against-the-rule astigmatism that was significantly higher than that caused by TCCI.[9]

Also, according to Nikose et al's study, SIA in the TCCI is less than in the SCCI, and the temporal group has a better visual outcome, better optical quality, and higher patient pleasure.[10]

The SIA of TCCI versus SCCI 2.8 mm CCI was studied by Marek et al. The temporal group's mean SIA was 0.63±0.28 D, while the superior group's was 1.00±0.54 D, and the differences were statistically significant. They also came to the conclusion that a 2.8 mm clear corneal temporal approach was superior to a SCCI of the same size.[11]

Clear corneal incisions are alluring, but they are not without risks, according to Al Mahmood et al. Regulated astigmatism, poor wound healing, and the loss of endothelial cells were among the drawbacks.[12]

Moon et al investigated the efficiency and stability of astigmatism in relation to incision size. They looked at three different sizes of self-sealing corneal incisions: 2.5, 3, and 3.5 mm. The mean SIA in the 2.5 mm group was 1.05 D, 0.84 D in the 3.0 mm group, and 0.95 D in the 3.5 mm group. Finally, they determined that the 3.0 mm incision size had the lowest SIA.[13]

Jauhari N et al[14] in 2014 compared the SIA in three different groups of patients, in which each group got a different type of incision. In 2005, Gokhale NS et colleagues analyzed the temporal and supratemporal groups and found that SIA was lower in the temporal and supratemporal groups than in the superior group.

Edmondo et al[15] evaluated surgically produced astigmatism after phacoemulsification surgery in eyes with mild to moderate corneal astigmatism in temporal and on-axis clean corneal incisions in a research published in 2006. After seven weeks of minor incision phacoemulsification surgery, the author found that the temporal incision caused less surgically induced astigmatism than the on-axis incision. The final UCVA and the best corrected visual acuity, on the other hand, did not differ much.

Morcillo-Laiz[16] et al evaluated topographic surgically generated astigmatism following biaxial phacoemulsification by superior-oblique trapezoidal 1.5–2mm incision vs. coaxial phacoemulsification via temporal 2.8mm incision. The medically induced astigmatism generated by both procedures, according to the author, produced identical magnitudes of astigmatism in the cornea. The surgeon can perform the micro incisional cataract surgery technique easily while sited in the head area as compared to lateral position expected in the Coaxial Phacoemulsification through the TCCI, due to the location of the incisions.

Discussion:

Cataract surgery is done to lessen the severity of post-operative corneal astigmatism in order to improve visual prognosis. It is critical to have a thorough pre-operative examination of corneal curvature for this.

Surgically produced astigmatism in the superotemporal and superonasal incisions were compared by Sitki et al[6]. In the medically induced astigmatism, the author found no significant differences. Although the author believes that SCCI in the left eye and TCCI in the right eye should be employed since they are more pleasant for the operating surgeon. Je et al[8] compared astigmatism

caused by the both horizontal incisions, i.e. temporal and nasal. The nasal incision, according to the author, has numerous possible disadvantages over a temporal incision. In the study by Simsek et al[9] he observed that post operative stigmatism was more in superior clear corneal incision as compared to temporal, probably because in superior clear corneal incision the pressure is applied more on the globe and the upper eyelid. Supporting the study of Simsek et al, the study conducted by Nikose[10] et al and Marek[11] et all also had similar observations. While Sitki et al, Simsek, Nikose, Gokhale and Marek studied the surgically induced astigmatism at various site; Moon[13] et al compared the consequence of dimension of incision (2.5-3.5mm) on post operative astigmatism. Moon et al observed that 3mm incision gave comparatively less magnitude of surgically induced astigmatism. Although Edmondo[15] et al and Morcillo-Laiz[16] got insignificant difference in visual outcome based on site of incision, but author thought it was more comfortable for surgeon to site on the head end and take superior incision than taking the lateral position for temporal incision.

Conclusion :

After going through various studies and their findings we arrived at a conclusion that a Temporal clear corneal incision & a 3.0mm incision caused less magnitude of astigmatism. However, when it comes to the comfort of surgeon and post-operative complications Superior clear corneal approach was found to be better option.

If pre-operatively, the horizontal axis is steeper the horizontal incision can be taken to have minimal postoperative surgically induced astigmatism. Likewise, if pre-operatively vertical axis is found to be steeper, a vertical incision can be

taken to have minimal magnitude of Surgically induced astigmatism post operatively.

It is also important for the surgeon to be at ease throughout surgery in order to get better surgical results. Hence both patient and surgeon's factor should be considered before proceeding for the surgery.

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