



A review of intraoperative complications of phacoemulsification in hard cataract.

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Abstract

Background: Phacoemulsification is the preferred technique for cataract surgery, but sometimes it is challenging as in case of hard cataracts. In this review we will discuss various intraoperative complications of phacoemulsification while handling hard cataract and ways to manage them. **Methods:** An extensive literature writing search was done using search engines like PubMed and Google scholar using significant terms/ key words “Phacoemulsification, intra-operative complications, hard cataract”. **Results:** A total of 34 studies were included in the review. The various etiological factors were discussed in detail. The most common factors were noted. **Conclusions:** There are myriad factors involved in the occurrence of postoperative dry eye of which transection of corneal nerves during surgery and the use of post-operative topical medication with preservatives, rank as the two most important causes.

Keywords: Phacoemulsification, intra-operative complications, hard cataract.



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INTRODUCTION

Manual small incision cataract (MSICS) surgery has emerged as a preferred technique in the management of cataracts, especially in a rural set up and in cases of grade 3 – 4 nuclear cataracts.[1,2] This surgery is performed through a 6.0mm – 6.5mm self-sealing sclera -corneal tunnel incision either in the superior or temporal portions of the sclera.[3] The incision is mostly left unsutured in the event of a good apposition of the sclero-corneal tunnel. In the immediate post-operative period a significant proportion of the patients develop symptoms of dry eyes the etiology of which may be multifactorial.[4] Although age may be a factor, derangements in the performance of the lacrimal functional unit have also shown to be responsible.[5,6] The symptoms of dry eyes seemed to improve with time. In this narrative review we have attempted to provide an insight into the various etiological factors of the dry eyes occurring after cataract surgery.

MATERIALS AND METHODS

An extensive electronic literature search was done using search engines like PubMed and Google scholar using the mesh terms/ key words “Pathogenesis, post-operative dry eyes, manual small incision cataract surgery”. The database revealed 77 articles out of which 34 were relevant for our study.

RESULTS

One of the main mechanisms discussed in studies by Cho et al, Kohlhaas et al, Sutu et al, Venugopal et al was cutting of the corneal nerves due to the surgical incision.^[7,8,9,10] Cornea has a rich nerve supply which is vital for its structural and functional integrity. The entry into the anterior chamber made during the small incision cataract surgery causes direct cutting of these nerve fibers thereby causing a reduced corneal sensation. This further disturbs the lacrimal functional unit feedback which in turn causes reduction in flow of tears and blink rate. This will lead to tear film instability. A previously

published study concluded that dry eye symptoms are more likely in early post-operative period in cases where grooved incision are performed.^[7] Neurogenic inflammation also might be one of the cause for reduced corneal sensitivity.

Studies done by Mao Kusano, Atsushi Kawahara, Jong Soo Lee, Xue-Min Li, Kensaku Miyake, Nathan G. Congdon mentioned that prolonged use of topical medications as eye drops postoperatively can cause dry eyes de-novo or worsen the clinical features in patients with preexisting dry eyes.^[11,12,13,14,15,16] Topical steroids and NSAIDs (non steroidal anti inflammatory drug) were the main culprits in this category.

Donghyun Jee and Veronica Pianini further highlighted the role of preservatives present in eye drops.^[17,18] The preservatives in corticosteroids, NSAIDS and antibiotic eye drops are toxic to the corneal epithelium and delay the healing process of the ocular surface. BAK or benzalkonium chloride is the most often implicated in this toxicity.^[19] Some post operative medications like Moxifloxacin eye drops are available as preservative free.^[20] However all other post-operative medications have preservatives, mainly BAK.

Tear film after cataract surgery was discussed in Studies done by Anubhav Baveja, Jayshree MP, Kensaku Miyake, Asadolah Movahedan, Yuli Park, Ratna Sitompul.^[21,22,15,23,24,25] Miyake et al. Studied the effect of diquafosol sodium (DQS) on the ocular surface in operated eyes after cataract surgery . Patients undergoing cataract surgery were evaluated using subjective symptom score, tear breakup time (TBUT), fluorescein staining of corneal and conjunctival and Schirmer I test preoperatively and 4 weeks after surgery.^[15] It was concluded that cataract surgery causes tear film instability and DQS can be useful in treating these patients.^[26]

Meibomian gland dysfunction as a causative factor for post operative dry eye was highlighted by

authors A.J. Bron, Kyung Eun Han, Yuli Park, Christine Sutu in their respective studies.^[27,28,24,9] In addition to this Meibum quality scores and lid margin abnormalities were also evaluated in the study by Yuli Park.^[24] A significant correlation was found between ocular symptom scores, inflammatory cytokine concentration and MGD parameters with dry eyes after cataract surgery.

Jin Sun Kim et al. reported in their study about the lipid layer thickness changes of the tear film after cataract surgery. LipiView interferometer was used to do Lipid Layer Thickness (LLT) measurements. They concluded that there was a significant reduction in Lipid Layer Thickness at one month post operative period.^[29]

Reduction in goblet cell density as a causative factor for dry eyes was highlighted in studies done by Kensaku Miyake, Christine Sutu, Taehoon Oh.^[15,9,30] A strong correlation between the loss of goblet cells and mean operative time was demonstrated in the study by Taehoon Oh.^[30] Topical Diclofenac use was found to be responsible for reduction in goblet cells in comparison with the other commonly used topical NSAIDs.^[15] Soon-Phaik Chee, Christine Sutu in their respective studies discussed surgical trauma and trauma due to inflammation to the ocular surface as a causative factor.^[31,9] This was most often encountered in patients with complicated cataracts and those with pseudoexfoliation.^[32]

Intra operative exposure to the operating scope light for prolonged periods was studied and discussed as an important causative factor for post-operative dry eye.^[33,34] This was most often encountered in surgeries by novice manual small incision surgeons who generally took a longer time to complete the surgery.

Thus, as per the various studies done in this regard, the aetiology behind the development of dry eyes following manual small incision cataract surgery is multifactorial. The following table lists the mechanisms as suggested by various authors:

Table 1:

SN	Author details	Mechanism / Pathogenic factors
1	Cho et al Kohlhaas et al Sutu et al Venugopal et al	Cutting of nerve endings due to surgical incision
2	Baveja et al Jayshree et al Miyake et al Movahedan et al Park et al Sitompul et al	Tear film instability after surgery
3	Kim et al	Thinning of lipid layer following surgery
4	Kusano et al Kawahara et al Lee et al Li et al Miyake et al Congdon et al	Long term use of topical medication
5	Jee et al Pianini et al	Presence of preservatives in eye drops
6	Miyake et al Oh et al Sutu et al	Decrease goblet cell density after cataract surgery
7	Chee et al Sutu et al	Surgical trauma and trauma due to inflammation to the ocular surface
8	Bron et al Han et al Park et al Sutu et al	Meibomian gland dysfunction
9	Cho et al Ipek et al	Operating microscope light

CONCLUSION

Clinically significant dry eye symptomatology was common after manual small incision cataract surgery. There are myriad factors involved in its occurrence of which, transection of corneal nerves during surgery, tear film instability and the use of post-operative topical medication with preservatives rank as the most important causes. A reduction in surgical incision size during MSICS by performing back cuts, using preservative free topical medications in the post-operative period and shortening the duration of the surgical procedure are some of the recommendations we would like to suggest to reduce incidence of post-operative dry eye symptoms.

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