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TO COMPARE CHANGES IN PRE-OPERATIVE AND POST-OPERATIVE KERATOMETRY IN HYDRATED AND NON-HYDRATED SCLERAL TUNNEL IN SMALL INCISION CATARACT SURGERY

Ophthalmology

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ABSTRACT

Aim And Background: The aim of the study was to compare the changes in pre-operative and post-operative keratometry in hydrated vs non-hydrated superiorly placed scleral tunnel in Small incision cataract surgery. **Material And Methods:** This is a hospital based, prospective interventional study which was conducted in the Department of ophthalmology, Muzaffarnagar medical college, Muzaffarnagar. Patients between the age group of 40-70 years including both males and females having cataract, having K1 more than K2 who underwent uneventful SICS were included in the study. Data was collected and compared with regard to pre-operative astigmatism and post-operative astigmatism. **Result:** In our study, Vertical keratometry(K1) and Horizontal keratometry (K2) was found to be statistically non-significant pre-operatively and post-operatively at 1 week, 3 weeks and 6 weeks between Hydration and Non-Hydration groups. **Conclusion:** There was no statistically significant difference in mean K1(D) and K2 (D) post operatively with hydration of the corneo-scleral tunnel. Post operative vision and astigmatism showed improvement over a period of 6 weeks. There was no remarkable difference in mean surgery induced astigmatism post operatively with hydration of the corneo-scleral tunnel.

KEYWORDS

keratometry, cataract, astigmatism, incision

INTRODUCTION

Cataract is one of the main causes of curable blindness in India and worldwide.[1] Cataract is defined anatomically as any lens opacity on or inside the lens, or functionally as only those lens opacities that interfere with vision.[1] It is the most prevalent visually disabling eye disease in the world. Millions of people in the world are blind with cataract accounting for 50% of blindness by World Health Organization (WHO). [2] Medical management has not been proven conclusively to prevent, delay or reverse the development of cataract in adults.[2] Surgery was the only treatment for cataract and it has been evolved tremendously.[3] Cataract surgery is now-a-days considered as a refractive surgery.[4]

In the developing countries like India, manual small incision cataract surgery is the most popular method. The advantage of MSICS is that, the integrity of limbal anatomy is preserved, thus minimizing the post-operative astigmatism.[5] It is a cost-effective surgery which is a prerequisite in a developing country like ours. In early ages, the purpose of cataract surgery was to achieve vision that could be sufficient for daily activity. But nowadays there are two main objectives of modern cataract surgery, one is to achieve rapid visual rehabilitation and other is to minimize the surgery induced astigmatism. So, the concern should be not only to correct the spherical ammetropia, but also to minimize the cylindrical error. Corneal astigmatism has been a by-product of cataract surgery, when large sized limbal incisions were made. With improved techniques the problem has been reduced. Astigmatism is that condition of refraction wherein a point focus of light, cannot be formed upon the retina owing to unequal refraction of incident light by dioptric system of eye in different meridians, but form focal lines.[6]

Manual SICS is a suture less cataract surgery due to self-sealing corneo-scleral tunnel. In this, the internal incision leading to entry into the anterior chamber is far away from the external scleral incision and the two are connected together by a sclero-corneal tunnel.[7] When the internal pressure of the eye is re-established, the high intraocular pressure (IOP), compared to the lower atmospheric pressure causes the tunnel to collapse and self-seal. The various incisions which are used in manual SICS vary according to their site, dimensions, design and architecture.[8]

The site of incision can be superior or superotemporal or temporal. The size of incision of a cataract surgery has progressively decreased over time with an incision of 12.0 mm for intracapsular cataract extraction and 10.0 mm for conventional extracapsular cataract extraction (ECCE) to MSICS of 6–7 mm and for phacoemulsification approximately 1.8–2.8 mm. A smaller incision gives distinct advantages to both the patient and the surgeon, in the form of early rehabilitation, better intraocular pressure control, and low or negligible postoperative astigmatism and complications.[9] Pioneering work by *Kelman* predicted that incisions 3mm wide would be astigmatically neutral because of their reduced size.[10] *Richard Kratz*. is credited as the first surgeon to develop the posterior sclera incision.[11] *Girrard and Hoffman* were the first to call this posterior incision as the "Scleral tunnel incision".[12] *Jaffe*.[13] has stated that a 7mm incision 2 mm behind the limbus can be left unsutured without the fear of induced against the rule astigmatism. A corneo-scleral tunnel has six aspects to have an impact on post-operative corneal astigmatism: size (i. e. the length of the tunnel), shape (style), location, depth, width and entry site into the anterior chamber.[14] After completion of the cataract surgery, the side ports are hydrated to seal the wound properly as compromised wound integrity may cause fluid leakage which may lead to collapse of anterior chamber. Chances of invasion of pathogens into the eye through this compromised wound may lead to endophthalmitis which is a dreaded complication of any intraocular surgery.[15] Though side port hydration is being practiced since ages but main port hydration has never been performed in SICS by ophthalmic surgeons. Whether hydration of the scleral tunnel at the completion of MSICS will induce any keratometric changes post operatively or not has not been studied in the past to the best of our knowledge. So, we are going to compare the changes in pre-operative and post-operative keratometry in hydrated vs non-hydrated superiorly placed scleral tunnel in Small incision cataract surgery.

MATERIALS AND METHOD

This is a hospital based, prospective interventional study which was conducted after clearance from Board of Studies and Ethical committee in the Department of ophthalmology, Muzaffarnagar medical college, Muzaffarnagar. Patients between the age group of 40-70 years including both males and females having cataract, willing to participate in the study having K1 more than K2 who underwent uneventful SICS were included in the study. Duration period of study was 18 months.

The sample size was 320 based on the number of SICS conducted in the Department of Ophthalmology during previous 3 years. All the recruited patients were randomly divided into two groups Group A (without scleral tunnel hydration) and Group B (with scleral tunnel hydration). Patients initially recruited but lost to follow-up, traumatic cataract, complicated cataract, any complication during surgery, patients on long term topical medication (glaucoma, uveitis, etc), patients with previous history of intra-ocular surgery in the same eye,

corneal abnormalities, patients with uncontrolled diabetes, grossly altered corneal topography, K2 more than K1 were excluded from the study. All the participants underwent SICS with Superior scleral incision of 6 mm size, Frown shaped with 2 mm Central distance from the limbus. Post – operatively keratometry reading were noted at each follow up visit. Data was collected and compared with regard to pre-operative astigmatism and post-operative astigmatism. Follow up of the patients were done after first, third and sixth week after surgery.

RESULTS

In our study, maximum subjects belonged to 51-60 years (44.5%) and 61-70 years (32.9%). There were 44.5% males and 55.5% females. There was no significant difference in mean astigmatism at Pre-operative data, Post-operative 1 week, Post-operative 3 weeks and Post-operative 6 weeks between Hydration and Non-Hydration groups. Vertical keratometry(K1) and Horizontal keratometry (K2) was found to be statistically non-significant pre-operatively and post-operatively at 1 week, 3 weeks and 6 weeks between Hydration and Non-Hydration groups (p-value>0.05).

Table 1: Distribution of study population according to mean K1(Vertical)

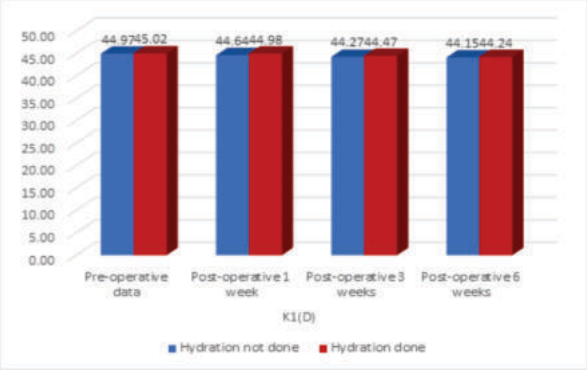


Table 2: Distribution of study population according to mean K2 (Horizontal)

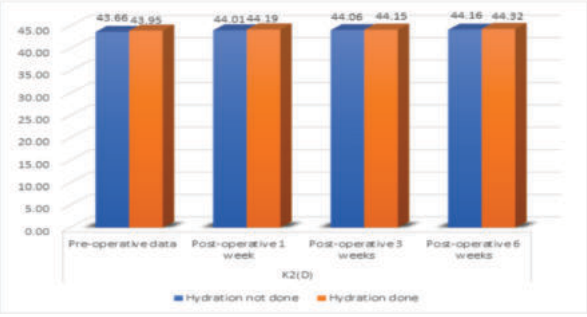
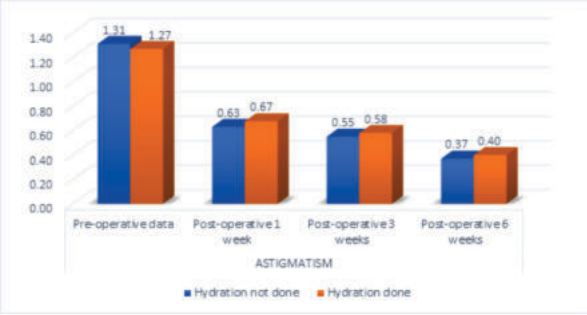


Table 3: Distribution of study population according to Astigmatism



DISCUSSION

Perhaps no other procedure in ophthalmology has changed so drastically and quickly over the past forty years as cataract surgery. A significant advancement in cataract extraction has been the switch from ICCE to conventional ECCE to SICS to phacoemulsification. Despite having a lot of potential, cataract surgery has historically evolved. The surgically generated astigmatism has been one of the most significant reasons. Therefore, one of the main objectives of contemporary surgical practice is to reduce surgically induced astigmatism [2]. We were motivated for this study by the side port hydration as it is being practiced since ages but main port hydration in SICS has never been done to the best of our knowledge. 320 patients were included in our study. Out of which 19 patients were lost during follow up. Of them, 13 patients were in the non-hydration group and 6 patients were in the hydration group. Therefore, the current study was conducted on 301 eyes of 301 patients who underwent manual small incision cataract surgery were evaluated for pre and post operative keratometry changes and astigmatism. All the patients completed 6 weeks follow up. As keratometric astigmatism is an objective measure of corneal contour unaffected by lenticular astigmatism, it was used as the basis for the astigmatism study. In our study, with hydration of the corneal scleral tunnel change in mean surgically induced astigmatism was not significant. We included all the patients with With The Rule astigmatism. Post operatively at 1week the mean astigmatism was 0.63 with decrease of 0.68. At 3 weeks it was 0.55 with reduction of 0.76. At 6 weeks it was 0.37 with reduction of 0.94 when compared to pre-operative astigmatism which was 1.31 in hydration group. In non-hydration group it was 1.27 preoperatively and 0.67, 0.58, 0.40 at respective visits at 1, 3 and 6 weeks. *Delfi and Lubis*.[16] found that mean keratometry on the 7th day was 0.412 D (p=0.035), and on the 30th day was 0.382 D (p=0.052). The AWR (astigmatism with the rule) group consisted of 20 patients, the mean keratometry on the 7th day was 0.384 D (p=0.192), and on the 30th day was 0.265 D (p=0.333). *Khanday et al*. [17] found that the first postoperative week revealed that the mean SIA in the SICS group was 1.60±0.90, as opposed to 4.00±1.23 in the ECCE group.

In current study, mean K1(vertical) at 1 week was 44.64, 44.27 at 3 weeks, 44.15 at 6 weeks post operatively and mean K2(horizontal) at 1 week was 44.01, 44.06 at 3 weeks, 44.36 at 6 weeks post operatively. *Khanday et al*. [17] found that Preoperative astigmatism ranged from 0 to 1D in 92% of the patients in the SICS group and from 0 to 1D in 94% of the patients in the ECCE group. Only 6% of the patients in the ECCE group had SIA in the 0-2D range, compared to 76% of those in the SICS group. In our study pre operatively, astigmatism was less than 1D in 62.6% and 61.7% of the patients, 36.1% and 36.4% patients had moderate astigmatism(1-2D) and only 1.4% and 1.9%patients had more than 2D astigmatism in hydration not done group and hydration done group respectively. The cornea has a propensity to naturally recover to the preoperative curvature, which in interaction with the SIA component impacts a change in the final postoperative astigmatism status, therefore the preoperative astigmatism is crucial in the result of the postoperative astigmatism. The postoperative visual outcomes are significantly impacted by the size and location of the incision. Induced astigmatism is inversely related to the distance from the limbus and directly proportional to the cube of incision length [18]. In current study, there was no significant difference in the distribution of Astigmatism Pre-operatively and post-operatively between Hydration and Non-Hydration groups. No significant difference was found in keratometry with hydration of sclero-corneal tunnel, however, a few difficulties were encountered during the study such as iris prolapse which was observed in 10 cases and entry of blood in anterior chamber which required AC wash again during surgery that was observed in 12 cases. Wound leakage, a post-operative complication in cataract surgeries, was seen in 8 cases of non-hydration group and in 2 cases of hydration group suggesting that wound sealing was found to be superior in the latter.

CONCLUSION

There was no statistically significant difference in mean K1(D) and K2 (D) post operatively with hydration of the corneo-scleral tunnel. Post operative vision and astigmatism showed improvement over a period of 6 weeks. There was no remarkable difference in mean surgery induced astigmatism post operatively with hydration of the corneo-scleral tunnel. Intra-operative complications like iris prolapse and hyphaema during SICS were more commonly seen in some patients of hydration group. Better wound sealing was noticed in hydration group compared to non-hydration group. A simple modification with hydration of the corneoscleral tunnel does not cause any significant change in astigmatism and in a developing country like ours where manual SICS is still being practiced regularly, so aim is to reduce the incidence of surgery induced astigmatism hence more research in a larger sample will further establish the validity of our observation.

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