Original Article

Single Step versus Three Steps Corneal Tunnel for Cataract Surgery

Induction of Post Operative Corneal Astigmatism in Single Step versus Three Steps Corneal Tunnel for Cataract Surgery: A Retrospective Study

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ABSTRACT

Objective: Identify the best possible surgical technique in order to have minimum possible unwanted astigmatism, hence reducing the significant symptoms associated. Furthermore to identify the best possible techniques in reducing surgical trauma, early rehabilitation and better patient satisfaction.

Study Design: retrospective analysis

Place and Duration of Study: This study was conducted at the Bodla Eye Care and Multan Medical and Dental College, Multan from March to August 2018.

Materials and Methods: 65 post phacoemulsification cases was done. Cases were operated by a single surgeon using ALCON 2.8 disposable keratomes. Keratomes were not reusable and intraocular lens of choice was ALCON AcrySof IQ SN60WF, with optic size of 6.0 and overall length of 13.0 mm. Intraocular lenses were inserted using ALCON approved Monarch IOL delivery cartridges.

Results: Out of 65 eyes there were 38 male (58.4%) and 27 female (41.5%) patients. From clinical notes grades of nuclear sclerosis were gathered at the time of presentation which was Grade-1 nuclear sclerosis in (1 eyes), Grade - 2, (17 eyes), Grade-3, (33 eyes), Grade-4 (11 eyes), Grade-5 (3 eyes). Preoperative visual acuity was found to be 6/12 or better in 4 (6.1%), between 6/18 to 6/36 in 48 (73.8%) and 13 eyes (20%) had a preoperative visual acuity of counting fingers to perception of light. Post operative visual acuity improved between 6/6 to 6/12 in 56 eyes and in 9 eyes, improved to 6/18 to 6/60. from 1st week, 8th week, 12th week, and 24th week clinic visit.

Conclusion: This study included 65 eyes that had phacoemulcifaction with posterior chamber intraocular lens implant. All patients had a single step, straight corneal incision using standard single use keratome. A gradual reduction in post operative corneal astigmatism was observed over a period of twelve months as per data gathered. Astigmatic error ranged from 0.00 to -0.50 Dcyl in 26 eyes (40%), 0.50 to -1.00Dcyl in 25 eyes (38.4%) , -1.00 to -1.50Dcyl in 14 eyes (21.5%). Comparing to data available on two or three step corneal incisions, it was found at par infact significant less astigmatic error was noticed. Furthermore on the part of surgeon visualisation of intraocular structures is better and allows greater access to the incision.

Key Words: Corneal Astigmatism, Phacoemulsification, Refractive Error.

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INTRODUCTION

Every surgeon is responsible for inducing a certain degree of corneal astigmatism following cataract surgery.[1,2] The purpose of this study is to determine how can we reduce the severity of problems faced by this necessary evil. There are a number of factors which influence this phenomenon.[3] This includes incision size, its configuration that whether its single, 2 or 3 steps, location of incision relative to limbus and the presence or absence of steep axis on which incision is made.[1,4] The ideal of all is a single step, less than 3 mm wide, temporally placed incision.[2,5] Easy said than done, our decision is very much influenced by unavoidable factors, including right or left eye, size of the eye ball, ease of approach to limbus , corneal thickness, depth of anterior chamber, pre existing corneal pathology and above all presence of preoperative astigmatism.[5,6] There are strong recommendations from various studies on placement of surgical incisions at the steep axes.[4,6] The obvious rationale is that the corneal incision will result in the flattening of steep axes with a secondary steepness of axes at right angle to the site of incision.[7]

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This will lead to a significant reduction of post operative corneal astigmatism.

Our study primarily focuses on the importance and surgical relevance of single step, straight incision in cataract surgery. Authors are of the view that this is the better choice among different techniques described in the literature previously.

MATERIALS AND METHODS

This is a retrospective, non comparative analysis of 65 eyes who underwent cataract surgery at Bodla Eye Care and Multan Medical and Dental College, Multan. Authors have ensured to rule out any bias and standardised the surgical practices for patients included in the study. All patients were operated by the same surgeon, using same disposable keratome to reduce any chances of discrepancy. Data was collected from the records spanning from first to 24th week ending in August 2018. All patients were operated using ALCON Infiniti microsurgical platform. There was an obvious difference in the degree of nuclear sclerosis as mentioned previously but that is unavoidable. This obviously can result in excessive use of phaco power leading to corneal wound burns. All patients with any per and post operative complications especially wound burn were excluded from the study. Visual acuity was not a parameter measured in this study, hence co morbidities e.g retinal pathology and glaucoma patients were included in the data collection.

RESULTS

A special focus was made on wound architecture. Instead of a traditional two or three step corneal incision it was more of a single step stab incision. The size of incision in all cases was 2.8 mm. Phaco tip sleeve again was of the same size to allow proper closure of the wound during surgical manipulation. Steeper axes were used where possible as based on keratometry readings. Incision was made in the clear cornea but it was tried to slightly nick the limbal vessels. This was to allow a secure self sealing post operatively. Supero temporal quadrant was used in majority of cases. This was keeping in mind that most patients have an against the rule astigmatism and they benefit more from a temporally placed corneal incision. It was ensured to achieve for a symmetric incision. That roof and floor were approximately of the same size. A radial entry was ensured in order to achieve the best possible symmetry. Obliquely placed incisions are known to leak postoperatively with a significant unwanted post operative corneal astigmatism. Corneal tunnels made following single step entry were of adequate size to prevent any problems associated with short or un necessary long tunnels.

DISCUSSION

Corneal incision is of pivotal significance in induction of post operative corneal astigmatism.[8] In the literature, there is always an emphasis on placing the incision along the steeper meridian.[9,10] It leads to a reduction in the keratometry readings on steeper axes making it more flat.[11]Elderly patients especially presenting with senile cataracts are known to have an against the rule astigmatism.[12] A superior approach can lead to further flattening of the flat meridian resulting in more post operative corneal astigmatism, hence should be avoided. [10,12]

In our study there was an obvious increase in the corneal astigmatism post surgery as expected. Our reported post operative corneal astigmatism is in comparison and acceptance of various studies already published.[13] Though our study is non-comparative but it does show an obvious benefit on two and three step corneal incisions which invariably are more prolonged. A superior corneal incision carries its own advantages.[14] It is easier to perform as no change in sitting position for the surgeon is required.[15] It does provide a physical support for surgeons hands on patient forehead. Moreover it is extremely difficult to convert a temporal approach to an extra capsular cataract extraction. [16] Despite of all mentioned facts, in our study we tried to avoid the typical 12'O clock position, hence better postoperative outcomes in terms of refractive error.

Authors would also like to stress on the ability of surgeon to perform cataract surgery using a temporal approach due to its obvious advantages. Authors believe that using steeper axes as the site of incision can result in much reduced postoperative corneal astigmatism and more rapid and complete visual and systemic rehabilitation. [17,18] Minimal invasiveness also help patients with functioning filtering blebs, on anticoagulant medications, dry eye syndromes and those going for combined surgery as trabaculectomy and Phaco.[19]

The possible complications that can be envisaged in single step tunnel are increased wound instability post operatively.[20] This can lead to endophthalmitis; iris prolapsed and flat anterior chambers.[21] Authors in this study did not came across any of these complications. We believe with adequate measures as optimum wound hydration and checking for post operative leaks on the table following surgery can significantly reduce the burden of such complications.

Knowing that the ultimate result of the incision is corneal flattening along the meridian of the incision, the surgeon can exploit this by operating along the steep meridian, thereby permitting the wound healing process to reduce the patients pre-existing astigmatism.[22]

Obviously, certain adjustments are required when moving the incision away from the superior meridian. The largest shift will be to a temporal incision, which will be used for eyes with preoperative against-the-rule astigmatism. Because the cornea is horizontally oval, the temporal limbus is located more posteriorly than the superior limbus.[22,23] Therefore, the temporal incision, must be, bevelled more anteriorly into the cornea prior to entering the anterior chamber, for temporal incision, it is recommend that entry in anterior chamber should be 1.5 to 2.0 mm from the limbus. [22,23]

The corneal tissue is soft, flexible and compressible, that mean the dissection into clear cornea can be squeezed tight by pressure against the endothelium from within the anterior chamber. [15,23] It is the pressure in the eye that closes the incision. The more pressure in the eye that closes the incision, the stronger the incision.

By choosing the suprotemporal limbus, for single step clear corneal tunnel formation, one can not only, have reduced postoperative corneal astigmatism, but it also helps, in changing against the rule to with the rule astigmatism, and reduces already existing corneal astigmatism.

CONCLUSION

In our study 65 eyes underwent suprotemporal clear corneal tunnel formation, and had a follow up of 12 months, showed corneal astigmatic error ranging from -0.00 to -0.50Dcyl (26 eyes), -0.50 to -1.00Dcyl (25 eyes), -1.00 to -1.50Dcyl (14 eyes), with gradual decrease in refractive error, over increase in postoperative period. Authors conclude that working at the temporal periphery not only, results in better patients satisfaction in the form of less postoperative corneal astigmatism, but also early rehabilitation. Furthermore, on the part of surgeon, working is relatively easier than going for a complete temporal approach. We did not come across any significant post operative complications related to a single step corneal tunnel formation.

Author's Contribution:

Concept & Design of Study:	Muhammad Afzal Bodla
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