

## Outcomes of sequential pterygium and cataract surgery: A prospective case series

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### Abstract

**Aim:** To evaluate the visual outcome and corneal stability after sequential pterygium and cataract surgery in patients presenting with both pterygium and cataract.

**Materials and Methods:** Twenty patients with pterygium more than 2mm on the cornea with immature cataract underwent sequential pterygium surgery with conjunctival auto-graft secured by autologous blood followed by manual small incision cataract surgery after one month as the cornea stabilizes.

**Results:** The mean age of the patients was 59.80±6.71 years. Nasal pterygium was present in 19 (95%), while one had both nasal and temporal pterygium in same eye. The immature cataract was nuclear sclerosis grade 2- 3 in all cases with posterior sub capsular cataract of variable densities. The mean uncorrected distant visual acuity UDVA at presentation was 0.95±0.27 logMAR units significantly improved post sequential pterygium and cataract surgery to 0.12±0.12 logMAR units (P < 0.001, Paired samples t-test). After sequential pterygium and cataract surgery the mean manifest astigmatism of the 17 (85%) patients with UDVA 6/9 – 6/6 and the 3 (15%) patients with UDVA 6/12 were – 0.42 D and -1.33D respectively.

**Conclusion:** The sequential surgery of pterygium excision with conjunctival autograft followed by manual small incision cataract surgery is the safe and effective way in providing the better visual outcome with proper counseling of patients regarding the outcome and their participation.

**Keywords:** Conjunctival autograft, Manual small incision cataract surgery, Pterygium.

### Introduction

Pterygium is common in our country, which is located within the tropics. Its prevalence varies from 0.7% to 31% in different geographical regions.<sup>1</sup> Pterygium is often accompanied with cataract in elderly patients.<sup>2</sup> The defective vision in these patients are due to cataract as well as the pterygium flattening the cornea.<sup>3</sup> Pterygium excision followed by cataract surgery as 2-step procedure has its advantage over simultaneous pterygium and cataract surgery in terms of corneal refraction stability post pterygium excision<sup>4</sup> and subsequent accurate Intra ocular lens power (IOL) calculation for better patient satisfaction. Though simultaneous pterygium and cataract surgery contribute to the reduction in hospital visits for the patient as a single step combined procedure is done, the accuracy of IOL power calculation was only moderately predictable as reported by Kamiya K et al.<sup>5</sup> The corneal refractive changes predictability based on the preoperative pterygium size is difficult and may lead to unexpected error in the postoperative refraction after a combined surgery as reported by Tomidokoro et al.<sup>4</sup>

In health programs, interventions which are cost effective and yet provide equally good outcomes should be adopted and actively propagated.<sup>6</sup> Pterygium excision with glue free and suture less conjunctival auto graft fixation using autologous blood<sup>7,8</sup> is cost effective.<sup>9</sup> As the corneal refractive component stabilizes by 1 month, cataract surgery done with precise calculation and cost effective approach<sup>10,11</sup> gives the better visual outcome.

This study aims to evaluate the visual outcome and corneal stability after sequential pterygium and cataract surgeries at one month interval in patients with both cataract and pterygium.

### Materials and Methods

All the patients presented with both pterygium > 2mm onto the cornea and immature cataract to our outpatient department from June 2016 to December 2016 were enrolled in this prospective study. History of ocular trauma and surgeries, presence of corneal scarring, retinal abnormalities, glaucoma and those who are on anti- coagulants are excluded from the study. The study was approved by Institutional Ethical Committee. Written informed consent was taken from all patients for surgery after explaining the nature and the consequences of the study.

All Patients underwent comprehensive ophthalmic examination. Preoperative uncorrected distant visual acuity (UDVA), best corrected distant visual acuity (BDVA), the pterygium length was measured as the horizontal distance between the pterygium head and the vertical tangent line to the corneal limbus on the preoperative slit-lamp photograph, as described by Kim S W et al.<sup>12</sup> Keratometric values of vertical and horizontal meridian were recorded with an automated keratometer (POTEC Autorefr-Keratometer PRK 5000, Appasamy associates, Tamilnadu, India). The axial length was recorded by APPASCAN AME - 01A, Appasamy associates, Tamilnadu, India and the Intra ocular lens (IOL) power was calculated using SRK/T

formula by APPASCAN AME-01A, Appasamy associates, Tamilnadu, India.

All patients underwent pterygium surgery as a first step, postoperative keratometric values were noted on the first post-operative day and 4 weeks later. By 1 month after pterygium surgery keratometry and A-scan biometry were done and intra ocular lens power was calculated using SRK/T formula by APPASCAN AME - 01A, Appasamy associates, Tamilnadu, India.

As a second step all patients had undergone cataract surgery with the calculated IOL power at 4 weeks post pterygium excision. Keratometric values, UDVA and BDVA were recorded at the first postoperative day, 4 weeks and 6 weeks. All the surgeries were performed by a single surgeon (G.K) using the same technique.

### **Surgical Procedures of Pterygium and Cataract Surgery:**

For pterygium surgery, after subconjunctival injection of lidocaine-epinephrine (1:100,000) into the tissue, body of the pterygium was dissected 4 mm from the limbus and reverse stripping of the pterygium head is done, haemostasis was allowed to occur spontaneously without the use of cautery. Conjunctival auto graft of 1.0 mm over size was procured from superior bulbar conjunctiva without tenon's layer and placed over the bare sclera in correct anatomical orientation and ensured that residual bleeding does not lift the graft. Lid speculum removed carefully and eye patched for 24 hrs. Post operatively 1% prednisolone acetate eye drops 4 times a day and tapered over 4 weeks. Moxifloxacin eye drops and lubricating eye drops were given for 4 weeks. Patients were followed up on the first day, 1 week and 4 weeks after surgery. Graft stability, post-operative complications if any, Keratometric values in both vertical and horizontal meridian, and patient's subjective comments of discomfort were recorded in each visit.

For cataract surgery manual small incision cataract surgery (MSICS) under peribulbar anesthesia was performed. The surgical technique consists of 6 mm temporal sclero corneal tunnel with a frown incision, side port made, continuous curvilinear capsulorhexis done, nucleus brought into anterior chamber and delivered by irrigating vectis, cortex removed by manual irrigation-aspiration and a rigid PMMA lens of appropriate power was implanted in the bag. Side port hydrated.

Post operatively antibiotic-steroid eye drops (ciprofloxacin and dexamethasone) were given 4 times a day initially and tapered over 6 weeks. Patients were reviewed after 1 week, 4 weeks and 6 weeks. Postoperative UDVA, BDVA, keratometric values were recorded at each visit.

**Statistical Analysis:** The data were entered in an Excel data sheet and analyzed using R software. The continuous variables are presented as mean  $\pm$  standard deviation (SD) and the categorical variables are presented as percentages. The changes of keratometry

over time, visual acuity, axial length and IOL power calculated were compared using paired samples t-test. The corneal astigmatism changes across time is observed by the statistical technique by name Repeated Measures ANOVA is used and further pair wise comparisons for time are done by using Bonferroni's test. The value of  $P < 0.05$  was considered statistically significant.

### **Results**

The study included 20 eyes of 20 patients. The mean age was  $59.80 \pm 6.71$  years ranged between 48 years to 70 years. There were 5 males (25%) and 15 females (75%). Out of 20 eyes pterygium, 10 (50%) was present in right eye and 10 (50%) in left eye. The nasal pterygium was present in 19 (95%) patients (Fig. 1A), while one had both nasal and temporal pterygium in LE. The immature cataract was nuclear sclerosis grade 2- 3 in all cases with posterior sub capsular cataract of variable densities.

The mean initial visual acuity UDVA at presentation was  $0.95 \pm 0.27$  logMAR unit, had improved to  $0.80 \pm 0.29$  logMAR unit post pterygium surgery, which significantly improved following cataract surgery to  $0.12 \pm 0.12$  logMAR units ( $P < 0.001$ , Paired samples t-test). Fig. 1B show one of the patient's immediate postoperative picture after pterygium excision with conjunctival auto graft secured by autologous blood and Fig. 1C an eye one month post pterygium surgery.

Out of the 20 patients, nine (45%), eight (40%) and three (15%) patients had achieved uncorrected distant visual acuity UDVA (Snellen's distant chart) 6/6, 6/9 and 6/12 respectively after they had undergone sequential pterygium and cataract surgery in a month interval. The mean manifest astigmatism of the 17 (85%) patients of final UDVA 6/9 – 6/6 was  $- 0.42$  D and the 3 (15%) patients of final UDVA 6/12 was  $- 1.33$  D. The horizontal length of the pterygium of the 17 patients were 2-3 mm on the cornea, Among the remaining 3 patients, two had the pterygium length 3-4 mm on the cornea and one had nasal and temporal pterygium of 2mm each on the cornea. The mean initial BDVA significantly improved from  $0.60 \pm 0.25$  to  $0.00 \pm 0.00$  ( $P < 0.001$ ). All patients had achieved final BDVA of 6/6 (Snellen's distant chart).

The mean keratometric reading was significantly increased from  $43.40 \pm 4.44$  D preoperatively to  $44.78 \pm 1.30$  D post pterygium surgery immediately ( $P < 0.05$ ) which had significant change after 1 month to  $44.97 \pm 1.19$  D ( $P < 0.001$ ) and changed to  $44.63 \pm 1.02$  D post cataract surgery. ( $P < 0.001$ ) (Fig. 2) The mean corneal astigmatism was significantly decreased from  $7.33 \pm 3.89$  D to  $1.85 \pm 0.90$  D post pterygium surgery immediately, which had a significant change after one month to  $1.49 \pm 0.85$  D and reduced significantly after cataract surgery to  $0.84 \pm 0.68$  D (Fig. 3). The mean corneal astigmatism across time on comparison by

Repeated Measures ANOVA: F-value=55.462; p-value=0.000 which clearly states that a statistical significance was observed between all the time points.

Nineteen patients who had nasal pterygium had their graft taken from superior bulbar conjunctiva and subsequently underwent temporal MSICS. Fig. 1D show one of the patient who had underwent temporal MSICS after he had his pterygium surgery in the same eye one month earlier. The one patient who had both nasal and temporal pterygium had the graft taken from inferior bulbar conjunctiva and underwent superior MSICS.

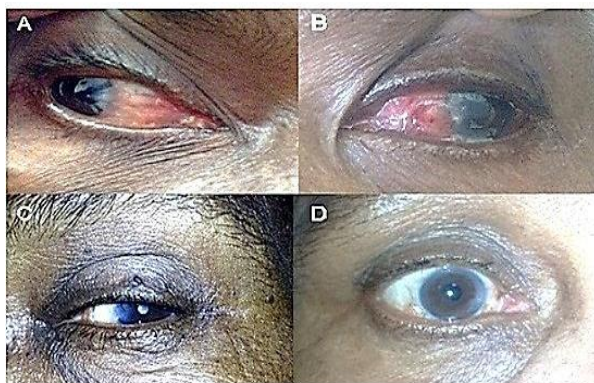
The mean axial length was significantly changed from 22.30±0.85 prior to pterygium surgery to 22.54±0.82 (P < 0.001) post pterygium surgery (Fig. 4). The mean IOL calculation significantly changed from 23.65±2.81 D prior to pterygium surgery to 21.65±2.38 D (P < 0.001) one month after pterygium excision (Fig. 5). There were no intra operative or postoperative complications requiring further treatment. Changes in the preoperative and the postoperative values are summarized in Table 1.

**Table 1: Preoperative and Postoperative values. (Mean±Standard Deviation)**

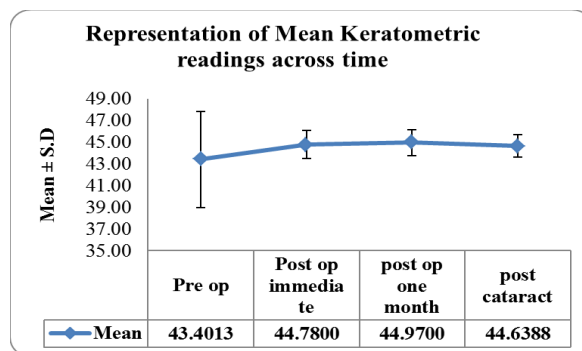
	Preoperative	Post pterygium surgery (One month)	Post cataract surgery (6weeks)
Mean Visual acuity (UDVA)	0.95±0.27 logMAR unit	0.80±0.29 logMAR unit	0.12±0.12 logMAR units
Mean keratometric reading	43.40±4.44 D	44.97 ±1.19 D	44.63±1.02 D
Corneal astigmatism	7.33±3.89 D	1.49±0.85D	0.84±0.68D
Axial length (millimeter)	22.30±0.85	22.54±0.82	
IOL calculation	23.65±2.81 D	21.65±2.38 D	

**Abbreviations:**

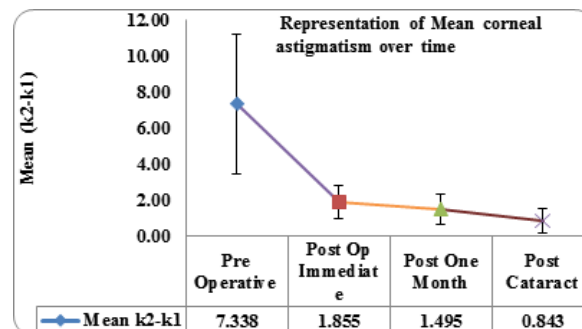
UDVA – uncorrected distant visual acuity, BDVA – best corrected distant visual acuity, LogMAR – logarithm of the minimal angle of resolution, SD – standard deviation, IOL – Intraocular lens, MSICS – manual small incision cataract surgery, D- diopter.



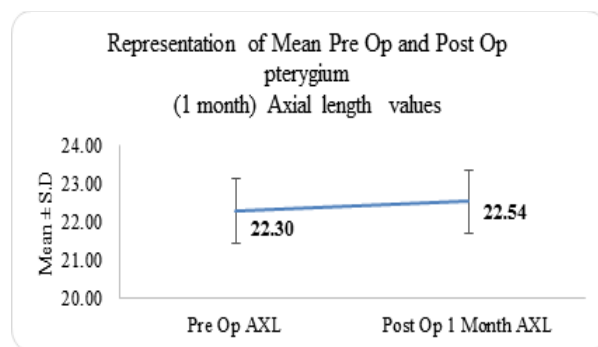
**Fig. 1: (A) shows an eye with nasal pterygium, Fig. 1: (B) shows an eye immediate postoperative after pterygium excision with conjunctival auto graft secured by autologous blood Fig. 1: (C) shows an eye one month postoperative to pterygium excision with conjunctival auto graft Fig. 1: (D) shows an eye after temporal section MSICS one month after the pterygium surgery**



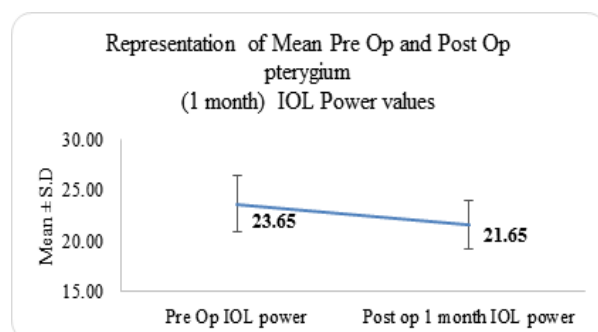
**Fig. 2: Representation of mean keratometric readings across time**



**Fig. 3: Representation of mean corneal astigmatism readings across time**



**Fig. 4: Representation of mean pre op and post op pterygium (1 month) Axial length values**



**Fig. 5: Representation of mean pre op and post op pterygium (1 month) IOL power values**

## Discussion

Pterygium excision with conjunctival auto graft is safe and more effective<sup>13</sup> and the suture less and glue free graft fixation using autologous blood is emerging as the economical option in the recent practice.<sup>7-9,14</sup> The cost of the sutures, prolonged surgical time, suture related complications<sup>7,15,16</sup> and the cost of glue,<sup>16</sup> its risk of transmissible disease were overcome by autologous blood which is natural, has no extra cost or associated risks and can overcome the postoperative discomfort, with cosmetic excellence.<sup>17</sup> In our study, using autologous blood we had no graft loss, dehiscence or recurrence noted similar to De Wit D et al<sup>14</sup> and Shaw et al,<sup>17</sup> whereas Kurian et al,<sup>7</sup> Singh et al,<sup>18</sup> Choudhuri et al<sup>19</sup> had reported encouraging results with the above postoperative complications. Vigorous eye rubbing attributing to the graft loss and dehiscence in the immediate postoperative period (24-48 hours) needs proper counseling of the patients regarding the surgical failure and their participation in avoiding them.

Our results showed that the mean keratometry values significantly increased post pterygium excision and stabilized one month later which was in line with the previous studies on corneal power change after pterygium excision.<sup>4,12,20</sup> The axial length measured pre and post pterygium excision increased significantly from  $22.30 \pm 0.85$  to  $22.53 \pm 0.82$  ( $P < 0.001$ ) in our study, as reported a possibility of significant myopic shift post pterygium excision leading to unexpected error in postoperative refraction there by affecting the

final UDVA on doing simultaneous pterygium excision and cataract extraction.<sup>4,5</sup> The IOL power calculation pre and post pterygium surgery decreased significantly from  $23.65 \pm 2.81$  D to  $21.65 \pm 2.38$  D ( $P < 0.001$ ) in our study.

Kamiya K et al<sup>5</sup> reported with simultaneous pterygium excision with graft suturing and temporal clear corneal phacoemulsification that the percentage of eyes within  $\pm 0.5$ D and  $\pm 1.0$ D of targeted correction were 48% and 82% respectively offering moderate predictability in combined procedure. In our study we used the cost effective and almost as effective as phacoemulsification, manual small incision cataract surgery MSICS<sup>10,11</sup> after the cornea has stabilized by one month after pterygium excision<sup>12</sup> and had 85% of them achieved final astigmatism within  $\pm 0.5$  D, and the final UDVA of 6/9 or better by 6 weeks post sequential surgery of pterygium and cataract in a month interval.. All patients have achieved their postoperative final UDVA 6/12 or better. Venkatesh et al<sup>21</sup> reported comparing phacoemulsification and MSICS in patients with white cataracts, that uncorrected visual acuity of 6/18 or better was achieved in 87.6% of eyes in the phaco group and 82% of eyes in the MSICS group by 6 weeks postoperatively of which 36.4% had achieved 6/9 or better in the MSICS patients.

In similar comparison Gogate et al<sup>22</sup> and Ruit et al<sup>23</sup> reported that uncorrected visual acuity of 6/18 or better was achieved in 71.1% and 88.9% respectively of the MSICS eyes at 6 weeks postoperatively of which 31.6% and 31.5% respectively had achieved 6/9 or better.

In our study the final uncorrected visual acuity 6/9 or better and the mean astigmatism  $-0.42$ D were achieved by 17 (85%) of them. They all had the horizontal length of the pterygium 2-3 mm on the cornea. Kim S W et al<sup>12</sup> had reported an insignificant change in the keratometric value post pterygium surgery with pterygium  $< 2$ mm on the cornea. Tomidokoro et al<sup>4</sup> reported that removal of pterygium having 20% extension on the cornea will lead to a 0.91 D increase of the corneal spherical power, but that prediction may contain considerable inaccuracy.

Among the 3(15%) patients, two had the pterygium length 3-4 mm on the cornea and one had nasal and temporal pterygium of 2mm each on the cornea had their final uncorrected visual acuity 6/12 with mean astigmatism  $-1.33$ D. Nejima et al<sup>20</sup> also stated, that topographic changes after pterygium excision were associated with pterygium size.

Cataract remains the leading cause of avoidable blindness worldwide,<sup>24</sup> As the cataract blindness has a profound economic impact through loss of productivity of both blind and the care givers, the sight restoring cataract surgery is undoubtedly one of the society's most cost effective interventions.<sup>25</sup> Khan A et al<sup>6</sup> and Muralikrishnan R et al<sup>11</sup> had stressed the importance of cost-effectiveness studies to ensure best interventions

among the alternatives to properly channelize the available resources for a sustainable growth in medical field. The current situation needs a high quality cataract surgery delivered at minimal costs to the poor, underserved populations with large burden of cataract blindness. Our cataract population has pterygium as a common occurrence.<sup>1</sup>

Although phacoemulsification with toric IOL would be a better option for these patients, the direct cost to the patients were significantly more for phacoemulsification compared to MSICS as reported by Khan A et al<sup>6</sup> and Ruit et al.<sup>23</sup> Also MSICS does not require the capital expenditure and maintenance of phacoemulsification machine with a dependable source of energy.<sup>6,10,11,23</sup> The foldable toric IOLs are more expensive than the rigid polymethyl methacrylate IOLs used in MSICS. Training in phacoemulsification also has a steeper learning curve.<sup>22</sup>

In our study we had approached those with both pterygium and cataract population most of whom from rural areas and carried out both the surgeries in a cost effective way providing better visual outcomes, which is very much in need for developing world as they face a challenge with significant barriers like shortage of trained personnel, scarcity of funds towards health programs and lack of awareness among the rural population.

## Conclusion

In conclusion our study shows that to deliver better outcome for those populations of cataract with significant pterygium, sequential procedure of pterygium excision with conjunctival auto graft followed by manual small incision cataract surgery after a month is the cost effective way for better visual outcome, better corneal stability, higher prediction of IOL power calculation.

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