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ORIGINAL ARTICLE

Assessment of Corneal Tomographic Changes after Pterygium Excision Using Autologous Graft Surgery by Pentacam

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ABSTRACT

Background: Pterygium is atriangular fibroelastic degeneration of the conjunctiva and subconjunctival tissue. **Methods**: quasi experimental study, comprising 52 patients aged from 35 to 60 during perid from April 2021 to April 2022 who underwent pterygium excision and autologus conjunctival graft. A total of 52 participants were enrolled and followed before and after 1 and 3 months after surgery by pentacam Scheimpflug camera . **Results**: there were significant changs in keratometric astigmatism at 1 month and 3 months compared with preoperative mean keratometric astigmatism, and there were statistically significant reduction in mean refractive astigmatism at 1 month and3 months postoperatively compared with preoperative mean refractive astigmatism. Also, a significant increase of spherical power of the cornea, there were statistically significant increase in average K1 at 1 month 3 months postoperatively compared with preoperative average K, There were statistically significant increase in average K 2 after 1 month,3 months, postoperatively compared with preoperative average K2, The mean BCVA was 0.31(0.13 SD) equivalent Decimal value preoperatively and improved significantly at 1 month postoperatively 0.48 (0.13 SD) equivalent Decimal value, P <0.001) and 3 months postoperatively 0.60(0.13 SD), P <0.001) when compared with preoperative values**.**
Conclusions: pterygium excision was associated with significant improvement in astigmatism.
Keywords*:* Conjunctival degeneration; Graft surger;, Scheimpflug camera.

INTRODUCTION

Pterygium is described as wing shaped invasion of the bulbar conjunctiva onto the cornea with wing-shaped ocular surface lesion [1]. Genetic factors, proinflammatory cytokines, and ultra-violet (UV) light are the most inclined factors in pterygium pathogenesis[2].Clinically, initial signs of disease progression have been represented by the presence of superficial gray dots mostly in the nasal cornea near the limbs,alterd conjunctiva opposite to the area of corneal affection, and displacement of the plica. Later, a wing-shaped fleshy growth of the bulbar conjunctiva onto the cornea takes place. A fully developed pterygium has a well formed “apex” or “head” (conical apex on the cornea), a “body” (conjunctival aspect extended from the limbus to the canthus), and a “neck” (at the limbus) [3].Pterygium is characterized by elastotic degeneration of collagen (actinic elastosis) and fibrovascular

proliferation. Sometimes a line of iron deposition from the head of the pterygium called Stocker's line. The location of the line might indicate the pattern of growth[4].

Controversy between limbal stem cell failure versus proliferation as the main pathology of pterygium still remains. It is considered as a limbal failure permitting the advancement of conjunctival epithelium on the cornea. This fibrovascular lesion overgrowth of conjunctiva on the corneal surface have been associated with dissolution of Bowman's membrane, connective tissue remodeling, chronic inflammation and angiogenesis [5].

Symptoms of pterygium included red eye, inflammation, foreign body sensation, tearing, dry and itching. In late stages pterygium may affect vision as it may invade the cornea with the potential of obscuring the center of the cornea and induce astigmatism and scarring of the cornea. Cosmetic appearance of the eye may be the main symptoms or may be associated with above [6].

Surgery is the gold standard of treatment for pterygium causing visual enchrochment. Recurrence is the most primary complication of pterygium surgery causing fibrovascular tissue across the limbus and onto the cornea. Bare sclera technique is the most common used was associated with high recurrence rates [7].Conjunctival autograft is the most widely used procedure for pterygium excision [8]. Visual disturbance considered the main indication for pterygium surgery and encroachment over the pupillary area or inducing astigmatism. Restriction in eye movements, chronic redness and foreign body sensation, and cosmetic concerns have been considered also as indication for surgery [7].Procedure was first described by **KATZIN. (1947)**and then became very popular. It has been reported a straightforward technique with variations that result in variations in reported recurrence rates [9].

METHODS

In this quasi experimental clinical study on 52 patients at ophthalmology clinic of Suez canal hospital, Ismailia , Egypt aged from 35 to 60 years old of either sex presenting with primary nasal, ocular irritation, visual disturbances, patient who accept participate in the study. withExclusion citeraia: Previous ocular surgery, contact lens wearer, patients with corneal scarring. pseudopterygia, ocular trauma or infection, retinal pathology, recurrent pterygium, enchroching pterygium, systemic disease that may affect wound healing such as diabetes &collagen vascular disease .

Preoperative evaluation:Written informed consent was obtained from all participants,the study was approved by the research ethical committee of faculty of medicine Suez canal university.The study was done according to the Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.We didanevaluationof a complete ophthalmic history to 52 patients, general medical history. Ocular examinationincluded Visual acuityusing Snellen chart at 6 meter.Best corrected visual acuity has been measured after taking the patient refraction with autorefractometer.

Slit lamp examination included Site of the pterygium ,corneal extension,pterygium vascularity, associated complications as symblepharon,. Fundus ophthalmoscopic examination was done by using78 D lens.Patient refraction using autorefractometer, and examination of extraocular motility. Intraocular pressure measurement has been done with Goldman tonometry.

Tomographic parameters such as average keratometric power of the cornea**,** anterior astigmatism and corneal thickness, BCCVA**,** Spherical error and cylindrical error measured before and after 1 and 3 month post operation. Astigmatism measured by pentacam scheimpflug camera before and after 1 month and 3months

Interventions Operative Procedure, Post Operative Care and Follow Up:First, topical anesthetic eye drops have been applied to the eye. Then disinfection of the eyelids done with 5% Povidone-Iodine, covering skin and the eyelids and opening the eye using clark‟s speculum.Subconjuntival anesthesia with Mepivacain Hydrochloride 3% has been

administered through the incision**.**Incision made into the body at a point 2-4 mm from the limbus which involved most of the pterygium body, then go back toward the cornea.Then through the initial incision, the pterygium was removed by Westcott scissors. Tenon‟s capsule tissue was also removed.. the exposed sclera has been irrigated with BSS

***Technique of Conjunctival Autograft Transplantation*:**Conjunctival defect measured by calipers. The globe was rotated inferomedially by asking the patient to look at this direction to access superiotemporal bulbar conjunctiva. Dimensions of the conjunctival graft have been measured with calipers and marked by a marker with subconjunctival injection of local anesthesia at the donor site. Afree conjunctival graft was harvested from the superior or inferior part of the conjunctiva. Then moving the graft to cover the area of defect with positioning of the limbal end of the conjunctival graft directly on the limbal border of defective area**.** Thensuturing the graftin place with 10 - 0 non-absorbable sutures.. Postoperative topical antibiotics, lubricants, and analgesics. sutures can be removed after 2 weeks, then pentacam can be done after 2weeks of removing sutures and after 3 month of surgery.

STATISTICAL ANALYSIS

Data was analyzed using SPSS (Statistical Package for Social Sciences) version 15. Qualitative data was presented as number and percent. Chi-Square test was used to compare between groups. Quantitative data was presented as mean ± SD. Comparison within groups was done by paired t-test. Comparison between two groups was done using student t-test. F-test (One Way Anova) was used to compare between more than two groups. P < 0.05 was considered to be statistically significant.

RESULTS

This study included 52 patients. this mean age was (44.4 -86.16) ranging from (35-65) years old.Males patients represent 39 eyes (0.75%).females patients represent 13 eyes (0.25%) .

***Keratometric astigmatism values*:** There were statisticallysignificantdecresein mean keratometric astigmatism after 1 month to 2.11 (1.01 sd) with p-value<0.001 and significantdecreseafter 3 month to 1.0 (0.65 sd) p-value<*0.001* postoperatively compared with preoperative mean keratometric astigmatism 5,58 (3.03 sd) **.(table 1)**

Refractive astigmatism values:Mean cylinder was -4.50 D before surgery and decreseafter 1m to- 1.50D significantdecrese after 3m to -.50 D with p valu 0.001 wich is statically significant **(table 2).**

BCVA values : The mean BCVA was 0.31 (0.13 sd) equivalent Decimal value) preoperatively and significantlyincreasedafter 1 month to 0.48 (0.13 sd) postoperatively equivalent Decimal value with *P <0.001*) and significantly increasedafter 3 months postoperatively to 0.60(0.13 sd) equivalent Decimal value, *P <0.001*) comparing with preoperative values.**(table 3).**

Spherical power of the cornea (k1): There were statisticallysignificantincreasein average K after 1 month 43.11 (1.82 sd) . P <0.001) and significantincrease after 3 months to 43.39(1.81sd) p<0.001), postoperatively compared with preoperative average K 39.0 (1,99 sd) **(table 4 a**).

Spherical power of the cornea (k2): There were statisticallysignificantincreasein average K 2 after 1 month 45.32 (2.35sd)D. P <0.001),3 months 45.26 (2.48sd) D p<0.001), postoperatively compared with preoperative average K2 44.52 (1.95sd) D (**table 4 b).**

1. ***Corneal thickness values:*** Mean Corneal thickness before operation was 535 Mm with standard deviation 21.52 and mean Corneal thickness after 1 month was 530.9 with standard deviation 20,97 and after 3 month to 534 with standard deviation 25,49 with p value 0.084 which is statically insignificant (**table5**).

Table (1):Comparison between the three periods according to keratometeric astigmatism (n =52 *)*

Keratometeric Astigmatism	Before	After 1 month	After 3 months	Fr	p
Min. – Max.	1.50-12.10	1.0 -4.30	0.30-2.02	104.0*	<0.001*
Mean ± SD.	5,58 ± 3.03	(2.11± 1.01	1.0±0.65		
Sig. bet. grps.	p_1<0.001*, p_2<0.001*, p_3=0.001*				
Overall decrease	4.58±2.69				

Table (2): Comparison between the three periods according to sphere and cylinder (n = 9)

	Before	After 1 month	After 3 months	Fr	p
Sphere					
Mean ± SD.	2.25 ± 0.0	2.25 ± 0.0	-0.50 ± 0.0	18.0*	<0.001*
Median (Min. – Max.)	2.25 (2.25 – 2.25)	2.25 (2.25 – 2.25)	-.50 (-0.50 – -0.50)		
Sig. bet. grps.	p_1=1.000,p_2=0.001*,p_3=0.001*				
Cylinder					
Mean ± SD.	-3.25 ± 0.0	-1.0 ± 0.0	-0.50 ± 0.0	18.0*	<0.001*
Median (Min. – Max.)	-3.25(-3.25 – -3.25)	-1.0 (-1.0 – -1.0)	-.50 (-0.50 – -0.50)		
Sig. bet. grps.	p_1=0.034*,p_2<0.001*,p_3=0.034*				

Table (3): Comparison between the three periods according to BCVA (n = 52).

BCVA	Before	After 1 month	After 3 months	Fr	p
Min. – Max.	0.17 -0.50	0.33-0.67	0.32-0.67	77.916*	<0.001*
Mean ± SD.	(0.31± 0.13)	(0.48± 0.13)	(0.60± 0.13)		
Sig. bet. grps.	p_1<0.001*,p_2<0.001*,p_3=0.024*				

Table (4): Comparison between the three periods according to K1 (n = 52).

K1 (d)	Before	After 1 month	After 3 months	F	p
Min. – Max.	41.10–32.80	46.20–41.0	46.20–41.0	105.30*	<0.001*
Mean ± SD.	1.99±39.0	1.82±43.11	1.81±43.39)		
Sig. bet. periods	p_1<0.001*,p_2<0.001*,p_3=0.001*				
Overall increase	2.93±4.39				

Table (5): Comparison between the three periods according to K2 (n = 52)

K2 (d)	Before	After 1 month	After 3 months	F	p
Min. – Max.	47.30–41.80	49.40–42.0	49.40–41.70	27.291*	<0.001*
Mean ± SD.	1.95±44.52	2.35±45.32	2.48±45.26		
Median (IQR)	44.45 45.80)–(42.50	45.85 46.50)–(42.75	45.65 46.0)–(43.10		
Sig. bet. periods	p_1<0.001*,p_2<0.001*,p_3=1.000				
Overall increase	1.05±0.74				

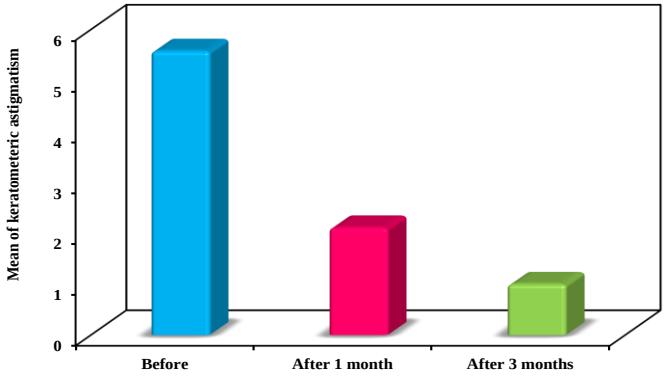

Figure (1): Comparison between the three periods according to keratometeric astigmatism (n = 52)

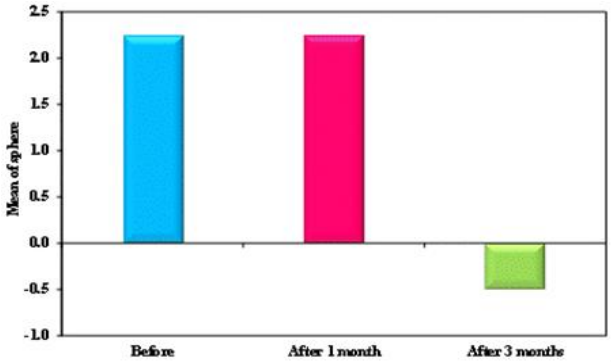

Figure 2: Comparison between the three periods according to sphere

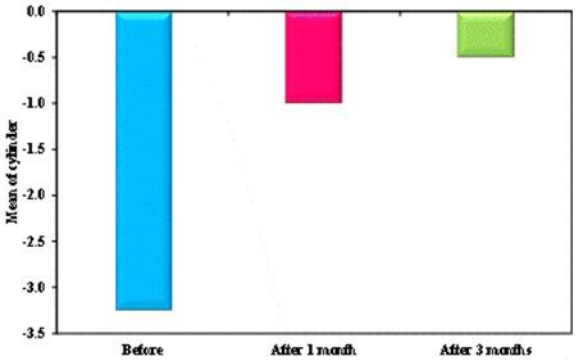

Figure (3): Comparison between the three periods according to cylinder (n = 52)

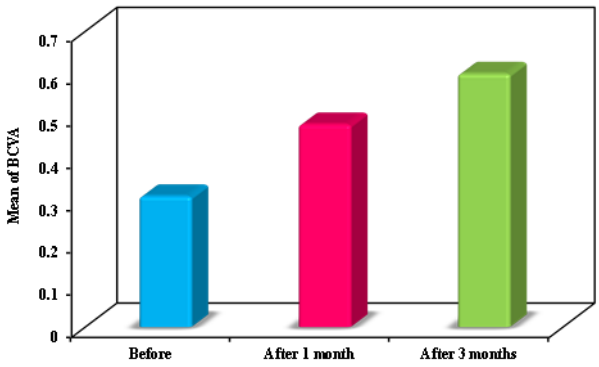

Figure (4): Comparison between the three periods according to BCVA

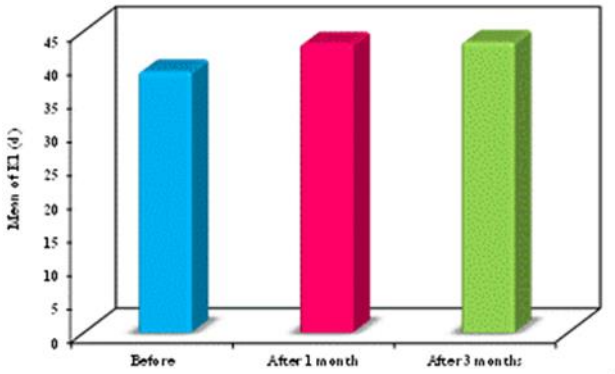

Figure (5): Comparison between the three periods according to K1 (n = 52)

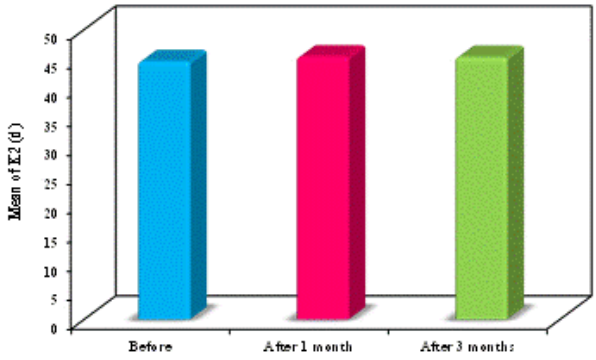

Figure (6): Comparison between the three periods according to K2 (n = 52)

DISCUSSION

The development of a pterygium lead to corneal distortion and astigmatism. pterygium cause localized flattening in pterygium apex. Flattening along the horizontal meridian usually causes with-the-rule corneal astigmatism [10].In this quasi experimental study, which comprising 52 patients aged from 35 to 60 during perid from April 2021 to April 2022 who underwent pterygium excision and autologus conjunctival graft. A total of 52 participants were enrolled and followed before and after 1 and 3 months after surgery**.** We did an evaluation of a complete ophthalmic history to 52 patients, general medical history. Ocular examination included Visual acuity using Snellen chart at 6 meter. Best corrected visual acuity has been

measured after taking the patient refraction with auto refractometer .

In a recent study pterygium seen in the age range of 29 to 72 years which mean that pterygium could be in all age groups [11]. Age group of 41-50 years is the most common to be foud, similary to the study from Goyal [12]. Many studies are in line with our study.. This study reported that there were a significant reduction in mean **keratometric astigmatism** post operatively**.** Mean preoperative astigmatism was 1.8 (1.35 sd) dioptres, and 1.15 (0.9 sd) dioptres after 1 month and 1 (0.46 sd) dioptre 3 months after the intervention [13]. There are many studies reported that after pterygium removal with CAU transplantation with human fibrin tissue adhesive, the **mean keratometric astigmatism** has been decreased from 5.55 (5.43sd) to 1.19 (0.86 sd) after one month and to 1.42 (0.87sd) after 3 months. The putative influences of pterygium removal on the cornea causes steepening of the cornea and decreasing compression and distortion [14].Also studies reported that after pterygium surgery, the **mean keratometric** astigmatism has been reduced from 2.25D to postoperative astigmatism of 1.30D [15]. Also, ***Shelke et al.,*** reported that the degree of **keratometric astigmatism** has been changed according to grade of pterygium. In Grade II, mean keratometric astigmatism has been decreased from 0 2.46 (0.54 sd) before the surgery to 0.97 (0.27 sd) after the surgery. In Grade III, the mean keratometric astigmatism decreased from 4.00 (0.57sd) before the surgery to 1.89 (0.64 sd) after the surgery. In Grade IV, **mean keratometric** astigmatism have been decreased from 6.58 (0.62 sd) before the surgery to 2.66 (0.75sd) after the surgery [16]. Also many studies reported that there were significant decrease in mean pre-operative **keratometric astigmatism** from 3.046 (1.20 sd) comparing with mean post-operative 1.486 (0.63 sd) (p<0.001) after pterygium surgery, which mean that astigmatism caused by pterygium surgery reduce it [17]. Also in, **Zheleva & Voynov**, study the preoperative **refractivecylinder** was 1.26 (1.18 sd) D (range 0.00D–5.00D), which decreased to 0.84 (0.73 sd) D (range 0.00D–3.00D) ($p < 0.001$) postoperatively [18].

The finding of our stuy are in line with studies which have been done on 39 primary pterygium cases. There were a statistically significant reduction in **refractive cylinder** after surgery, comparing with mean pre operative **refractive cylinder** was 1.34D which decreased to 0.58D postoperatively these results were compatible with our results [19].Other study on 15 eyes of 15 patients with primary pterygium were excised by conjunctival autograft. There were statistically significant decrease in mean **refractive astigmatism** preoperatively 3.67 (1.02 sd) D to 2.05 (0.57sd) D after 1 month,and significantly decrease to 1.80 (0.46sd) D after 3 months and 1.52 (0.48sd) D after 6 months postoperatively (p<0.001*) [20].Also in **Altan &Yaycioglu,** study when the lesion reached the paracentral corneal area, the corneal stroma and Bowman's layer have been changed, which is responsible for incomplete restoration of corneal curvature and refractive changes in eyes after pterygium surgery [21]. Also ***Shelke et al.,*** found an improvement in **BCVA** after pterygium removal with conjunctival autograft. VA has been improved in twenty eight patients (75.68%). From those 28 cases, 17 patients (44.85%) VA was have been increased by 2 lines and 11 patients (30.83%) by 1 line of Snellen‟s chart. There was no change in VA in 8 patients (21.62%), and there was decrease in VA by 1 line in one case [16].

However, ***Oh and Wee.*** in their study have been reported that there were no significant differences in **BCVA** when pterygium removed by limbal-conjunctival autograft

technique [22].

Our study is in agreement with ***Errais et al.,*** study on 20 eyes with pterygium which have been excised with limbo-conjunctival autograft surgery. The study reported significant increase in **spherical power** of the cornea after surgery, demonstrated that surgery play an important role in decreasing flattening of the central cornea caused by pterygium [23].

There are many studies reported that location of the pterygium in the superficial corneal lesion alters its corneal topography. Due to ingrowth inside corneal tissues, traction forces lters its corneal curvature, causing flattening in the horizontal meridian, increasing topographic astigmatic aberration. So significant increase in the power of the corneal in response to pterygium removal during the 3-month follow-up. Our results are in agreement with previous studies [24-25-26].

CONCLUSIONS

Pterygium excision was associated with significant improvement in astigmatism and markedly incease its power. There were significant improve in VA and there were no markedly changes in its corneal thickness.

CONFLICT oF INTEREST: None.

FINANCIAL DISCLOSURE:None.

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