TOPOGRAPHIC CHANGES AS PREDICTOR FOR DETERMINING ANTERIOR CORNEAL CURVATURE STABILIZATION POINT SUBSEQUENT TO PTERYGIUM EXCISION USING CONTROLLED PARTIAL AVULSION FIBRIN GLUE TECHNIQUE

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ABSTRACT

Introduction: This paper aimed to determine the corneal stabilization point using corneal topographic approach subsequent to pterygium excision using controlled partial avulsion fibrin glue technique. **Methods:** Ninety-three eyes of 93 patients who had undergone primary pterygium excision surgery were retrospectively reviewed. Topographic changes, based on changes in Simulated-K (SimK), were determined by having four (4) follow-up sessions (at 1st, 3rd, 6th, and 12th month post-surgical. The parameter studied was the degree of astigmatism measured with Zeiss ATLAS 995 corneal topographer. Three measurements were taken and only the measurement with the best image quality was accepted. These measurements were conducted by a single operator and performed by the same operator for each follow-up visit. All participants then underwent pterygium excision performed by a consultant ophthalmologist (KMK). RM-ANOVA and Bonferroni post-hoc analysis were employed to evaluate the difference between sessions with SimK. **Results:** Topographic changes revealed corneal stabilization point at 3rd month post-operatively. Significance improvements for corneal astigmatism was noted for the 1st and the 3rd months (both $P< 0.001$), followed by insignificant changes towards the remaining 6th and 12th months visits (both $P> 0.05$). **Conclusions:** Anterior corneal curvature stabilization point is obtained at 3rd months of post-surgical procedure.Thus we suggest other refractive procedures are safe to be performed after the 3rd month of pterygium excision.

KEYWORDS: pterygium; tisseel glue; fibrin tissue adhesive; stabilization; cornea

INTRODUCTION

Pterygium is an abnormal corneo-limbal disorder characterizes by abnormal growth of fibrovascular tissue originated from bulbar conjunctiva onto the cornea[1]. Previously, pterygium has been regarded as degenerative disorders due to presence of the degenerated connective tissue, which signify elastolic degeneration[1]. However, recent studies suggested that there are significant proliferative histological properties and clinical characteristics[2,3] which leaned towards excessive proliferative disorders such as mild dysplasia, local invasiveness and clinical features of high recurrence rate following ~~to~~ pterygium excision. Although many surgical approaches have been proposed, the exact causes of recurrence are still unknown.

Several studies have commented on the recurrence of pterygium subsequent to pterygium tissue excision 4-6 which varies greatly based on pre-operative demographics, surgical techniques and adjunctive treatments. Although there are several methods of pterygium excision with variations of recurrence rate of pterygium, the main objective of surgical excision remain the same. In any ptergyium excision methods, it is aimed to minimise post-operative complication, shorter surgical duration and shorter recovery period.

Previous reports have demonstrated that even before entering the optical zone, an advancing pterygium can cause visual impairment by inducing local topographic changes of corneal flattening which induce with-the rule astigmatism[7]and these effects can be reversed following its removal. Surgical treatment modalities such as bare sclera[5], adjuvant therapy using antimetabolites and ß-irradiation[7], adjuvant surgery via conjunctival autograft[8,9], amniotic membrane transplantation[6,9] and fibrin glue adhesive method[10-14]. This latter technique has been proven to be as safe as the conjunctival

autograft transplant but more effective in preventing recurrence after excision of recurrent pterygium[15] and also an effective treatment in primary pterygium[16].

METHODS

This study comprised of 93 primary pterygium eyes from 93 patients recruited from a University eye-specialist centre in order to display a wide range of severity of pterygium patients. All participants in this study were selected based on specific criteria as previously described[17-19]. Diagnosis and classification of primary pterygium were performed by a single ocular surface expert (KMK). The study was conducted according to recommendation of the tenets of Declaration of Helsinki and approved by the International Islamic University Malaysia (IIUM) research ethical committee (IREC) (IIUM/310/G13/4/4-125). Written and informed consent was obtained from all participants prior to procedures performed.

Surgical Procedures

All participants underwent comprehensive optometric examination comprising of dry refraction, slit-lamp examination and fundus examination. Then, each participant's average central corneal curvature utilizing Simulated-K (SimK) index was objectively measured using Zeiss ATLAS™ 995 corneal topographer (Zeiss Meditec, Inc, Dublin, USA). . Three measurements were taken and only the measurement with the best image quality was accepted. These measurements were done by single operator and performed on each follow-up visit by the same operator. Then, all participants underwent pterygium excision as described in detail below, performed by the same surgeon (KMK).

All participants were then followed for a 1-year period[15,16] comprising of four (4) follow-up sessions (at 1st, 3rd, 6th, and 12th month post-surgical), with similar measurement as in pre-surgical session performed by the same operator for all sessions. In confirming of any recurrence of pterygium, digital image were taken on each data collection session with clinical presence of any fibrovascular growth 1 mm past the corneo-scleral limbus and onto clear cornea are taken as positive recurrence[15].

Statistical analyses were performed using IBM SPSS (Predictive analytics software) (Version 19, SPSS Inc., Chicago, IL, USA). Repeated measures one-way analysis of variance (RM-ANOVA) was employed to evaluate significant difference in SimK between five (5) sessions. Bonferroni post-hoc analysis was employed to determine which pair was significant. A significance level of $P< 0.05$ was set as the confidence level.

This study had adopted a standardized procedure in all 93 pterygium samples. All cases were performed as a day care surgical procedures under topical and subconjunctival anesthesia by one surgeon (KMK). Pterygium excision was performed in an identical manner in all of the cases—the body of the pterygium was dissected 4 mm from the limbus and reflected over the cornea, and removal of the pterygium head was continued using a Beaver No. 64 surgical blade (Becton Dickenson, Waltham, Mass) with a blunt dissection technique. Excessive tenon's were cleared at the bare area and limbus regions were polished and smoothen using 3.3 diamond burr (Katena Ophthalmic burr (K2-4920), Katena Diamond burr diameter ball (K2-4923), Katena Product Inc, New Jersey, US).

All eyes received a conjunctival autograft, a thin, free conjunctival graft was superficially dissected from the superior bulbar conjunctiva with careful attention to avoid taking the underlying Tenons layer. Grafts were premeasured to be oversized by 1 mm horizontally and vertically compared with the bare sclera defect. Graft margins were glued using fibrin glue (Tisseel™, Baxter AG, Vienna, Austria) at the sclera area. All patients received gutt 0.5 % 5 ml of moxifloxacin (Alcon Laboratories, Fort Worth, TX) qid, gutt 0.1 % 5 ml dexamethasone (Alcon Laboratories, Fort Worth, TX) qid and 0.18 % 0.3 ml Vismed® artificial tear preservative free (TRB Chemedica International SA, Geneva, Switzerland) qid on both eyes for three (3) weeks post-operatively.

RESULTS

The analysis include 93 participants, where 50.5% (n = 47) were men. Normality testing was evaluated using ratio of skewness and kurtosis[20], with ± 2.50 was taken as normal distribution. Normality testing showed all data were normally distributed. Descriptively, this study found a decreasing trend in SimK from baseline (pre-surgical) towards 12th months follow-up.

RM-ANOVA results showed that there was significance difference in at least one pair of the sessions for all corneal indices. For SimK, the mean and standard deviation (SD) was highest at baseline with 4.64 ± 4.18 D, and drastically decreased to 0.63 ± 0.43 D at 1st month post-surgical (P< 0.001). SimK was found gradually decreased towards 3rd months with 0.57 ± 0.45 D (P< 0.001). From 3rd months onwards, we found no significance difference in SimK between the 4th session (6th month) and 5th session (12 months) with 0.57 ± 0.45 D and 0.57 ± 0.44 D respectively (both P> 0.05) as shown in Figure 1.

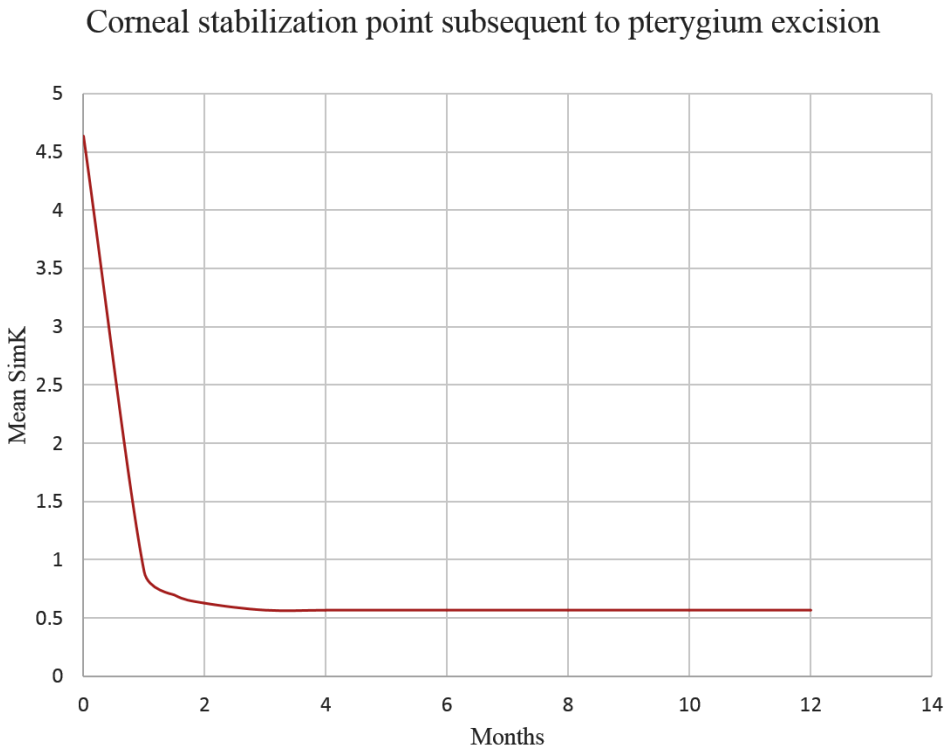

Figure 1. Corneal stabilization point relative to 12-months follow-up based on changes in corneal astigmatism using Simulated-K (SimK).

DISCUSSION

Corneal stabilization point is important to be determined as it represents the cut-off time which are safe for other refractive procedures. In clinical setting, corneal stabilization point is commonly applied in decision-making process especially in prescribing optical aids subsequent to surgical procedure. Mistakes in prescribing would give unnecessary negative financial impact to patients.

Koranyi[19] and his co-workers proposed a "cut-and-paste" surgical method known as fibrin glue adhesive method for management of patient's with pterygium. This technique has been

deliberately discussed in previous work[12]. Concept of fibrin glue adhesive method is similar as in wound healing process. Recent works[13,14,16] had commented that fibrin glue adhesive method has the lowest recurrence rate of pterygium compared to other surgical methods with ranges from zero to 8.16%. In light with this present study, we found no recurrences of pterygium noted throughout the study period. This surgical method provides several advantages as it is sutureless, which means less postoperative complication and require less operating time. Previous works[12-16] had noted that this method is clinically safe and efficient compared to other surgical methods.

Decrease in SimK during post-surgical assessment indicates that the anterior corneal curvature reverts back to its normal prolate shape. In presence of pterygium, localized flattening[7], based on the blue-coloured scale in corneal topographer output concurrent with pterygium progression. We propose this corneal recovery process could be due to two reasons; different types of pterygium morphology (fleshiness) and effect of corneal compression as pterygium progresses.Firstly, pterygium fleshiness could cause the increase in SimK as the whitish appearance of pterygium could signify presence of excessive proliferative fibrovascular tissue[21,22]. Excessive proliferative growth of pterygium could induce corneal compression which leads to increment in induced corneal-astigmatism (SimK).

Secondly, with progression of pterygium, it could indirectly induce corneal compression. Compression on the anterior corneal curvature could be explained based on two (2) factors. Firstly, increase of mechanical tension of the pterygium fibrovascular tissue on the cornea which stretches from bulbar conjunctiva could lead to corneal compression. Secondly, corneal compression could be due to excessive pressure of fibrovascular tissue weight on the corneal surface. We postulate that this could be due to pterygium fleshiness as whitish appearance in fleshy pterygium could suggest higher fibrous tissue composition which could increase the lesion mass. However, based on our literature search, there was little information[23,24] on impact of higher lesion mass on induced-corneal compression. Fibrous tissue composition could provide another perspective on impact of pterygium on anterior corneal curvature, in which has not been properly addressed.

CONCLUSION

Corneal stabilization point is suggested approximately at 3rd month post-surgical. Hence, further refractive procedures or optical prescription is safe to be conducted or given after the corneal stabilization point.

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DECLARATION OF INTEREST

The authors report no conflicts of interest

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