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Original article

Clinical and Visual Outcomes of Transepithelial Photorefractive Keratectomy After Myopic Correction in A Private Clinic in Benghazi Using Schwind Amaris

Mostafa El Awami*, Hamad Elzarrug

Department of Ophthalmology, Faculty of Medicine, University of Benghazi, Benghazi, Libya

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Corresponding Email. *mostafa.elawami92@gmail.com*

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ABSTRACT

This study aimed to assess the results of correcting myopia with transepithelial photorefractive keratectomy (TransPRK) performed using the Schwind Amaris Machine. A total of 44 eyes have been included in this prospective study. The preoperative sphere was between (-1.25 and -8.00 DS), while the preoperative cylinder dioptres varied from (-0.75 to -5.00 DC). Before surgery and three months later, measurements were conducted to evaluate uncorrected (UDVA) and corrected (CDVA) distance visual acuity. The study focused on both clinical and visual outcomes. Following Three months after TransPRK, the included eyes had an uncorrected distance visual acuity better than or the same as preoperative CDVA; no patient showed loss of two lines; 31.8% (14 eyes) maintained the same level; 54.5% (24 eyes) improved by one line; 11.3% (five eyes) improved by two lines; and the remaining 2.2% (one eye) had a decrease of one line. The slit lamp exam post-operatively shows complete epithelial healing within five days, but only 4.35% (one candidate) show grade 1 central haze. TransPRK is a reliable and effective option for managing myopia safely.

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INTRODUCTION

Refractive errors, including astigmatism and myopia, are the primary cause of vision impairment worldwide. A meta-analysis of fifteen cross-sectional and population-based adult cohort studies conducted in Europe revealed a myopia age-standardized prevalence of 30.6% and 23.9% for astigmatism [1]. The prevalence of myopia is increasing on a global scale. It is estimated that by 2050, half of the world's population will have myopia, with 10% being highly myopic [2]. Technological advancements have minimized complications in surgically correcting spherical and cylindrical refractive errors. Precise correction is essential for improving refractive indices, especially in cases of astigmatism. Transepithelial photorefractive keratectomy (TransPRK) is a commonly selected procedure for its flapless and streamlined single-step process. Numerous studies have examined the refractive and visual results post-TransPRK [3-5]. This study aimed to evaluate the effectiveness of TransPRK in correcting mild to moderate myopia and myopic astigmatism.

METHODS

Study design and patient population

A prospective interventional study was conducted at a private clinic in Benghazi, Libya, involving 44 eyes from 23 patients with myopia. Sphere (-1.25 to -8.00 DS) cylinder (-0.75 to -5.00 DC) patients treated with Trans PRK in Ibn

Sina clinic between 2 JAN to 27 Feb 2024. All patients were informed through written consent, and the study protocol adhered to the principles of the Declaration of Helsinki.
A comprehensive ophthalmic examination was conducted for all participants, including a slit lamp exam, dilated fundus exam, UAVA, BCVA, and IOP measurement using the Pantacam Schimflug camera (Oculus, Germany). All the candidates who took part were deemed suitable for refractive surgery; no borderline patients were included.

Surgery
A single surgeon utilized the Scwind Amaris 750s excimer laser platform with aberration-free protocols through ORK-CAM software for the surgery. All candidates underwent testing for static syclotorsion SCC before the procedure, which was successful. Based on the Schwind database, ablation indicated a central epithelial thickness of 55 microns. Following the ablation, stromal irrigation was performed using cold isotonic normal saline, and a soft contact lens was applied as a bandage until complete epithelial healing was achieved. Post-
operative medications prescribed to patients include topical Moxifloxacin three times daily for two weeks, topical Dexamethasone four times daily (with a taper over four weeks), and preservative-free lubricant five times daily for three months.

Main Outcome Measures
The main outcomes include preoperative manifest refraction, uncorrected and best-corrected visual acuity, postoperative (3-month) refraction, uncorrected visual acuity, and clinical slit lamp examination.

Statistical analysis
Data was analyzed using the Statistical Package for the Social Sciences (SPSS, version 25). The continuous variables are presented as mean ± SD, while the categorical variables are presented as frequency and percentage. The quantitative data were tested for normality using the Shapiro-Wilk test.
The nonparametric Kruskal-Wallis H and Wilcoxon signed-rank tests were used to compare the median values of non-normally distributed data. Chi-square was employed to compare categorical variables.
A Kruskal-Wallis H test was conducted to assess differences in visual acuity (log MAR), and a Wilcoxon signed-rank test was performed to evaluate the impact of Trans PRK on visual acuity before and 3 months after surgery. Spearman's correlation analysis examined the relationship between preoperative and postoperative visual acuity, with $P<0.05$ considered statistically significant.

RESULTS

Visual outcomes
This study included 44 eyes of 23 patients treated by TransPRK. The mean patient age was 25.57±4.24years (range 23-27 years) with a female predominance of 75%. After 18 months, all eyes were examined. Vision parameters post-surgery showed significant improvement for the patients. The general characteristics of the population are detailed in Table 1.
The preoperative and postoperative visual acuity (including BCVA and UAVA) and refractive outcomes like sphere, cylinder, and spherical equivalent were summarized in Table 2. A significant improvement was noted between preoperative and 3 months postoperatively ($p < 0.001$). The median of the visual acuity log MAR showed a statistically significant difference between the two groups. $\chi^2(5)= 35.72$, $P < 0.001$.
Data are median unless specified otherwise. Out of the 44 eyes included in this study, there was a statistically significant median improvement in visual acuity after 3 months (0.8) compared to preoperative (0.7) ($z = -4.73$, $P < 0.001$).
Spearman's correlation analysis revealed a significant strong positive correlation between preoperative and postoperative visual acuity $r (42) =0.875$, $P<0.001$.

Safety and efficacy
Figure 1 compares preoperative best-corrected visual acuity (BCVA) and postoperative unaided visual acuity (UAVA). Figure 2 illustrates the changes in CDVA from preoperative to three months postoperatively. No patient experienced a loss of two lines; 31.8% (14 eyes) maintained the same level; 54.5% (24 eyes) improved by one line; 11.3% (5 eyes) improved by two lines; and the remaining 2.2% (1 eye) had a decrease of one line.

Clinical outcomes
No complications that threatened vision were observed. Only one candidate, 4.35%, developed grade one peripheral corneal haze. Based on tear breakup time, all candidates show grade zero to grade one dry eye, except for two candidates (8.7%) with more than -6.00 DS refractive error, who show grade two dry eye.

Table 1. Demographic characteristics and variables for the cohort of the eyes.

Value (%)	Number %	Mean ± SD	Age Range	P value
Age		25.57±4.24	23-27	0.000
Gender Male(n) Female(n)	11(25%) 33(75%)	27.45±3.3 24.94±4.3	26-32 22.5-27	

Table 2. Summary statistics of refractive and visual outcomes

Item	Mean±SD	(range) (Median)	*P* value
Preop BCVA	0.781±0.18	(0.6_1) 0.7	< 0.01
Preop BCVA (log MAR)	0.11±0.09	(0.00_0.2) 0.15	< 0.01
Postop UAVA	0.886±0.202	(0.7_1) 0.8	< 0.01
Postop UAVA (log MAR)	0.06±0.104	(0.00_0.15) 0.1	< 0.01

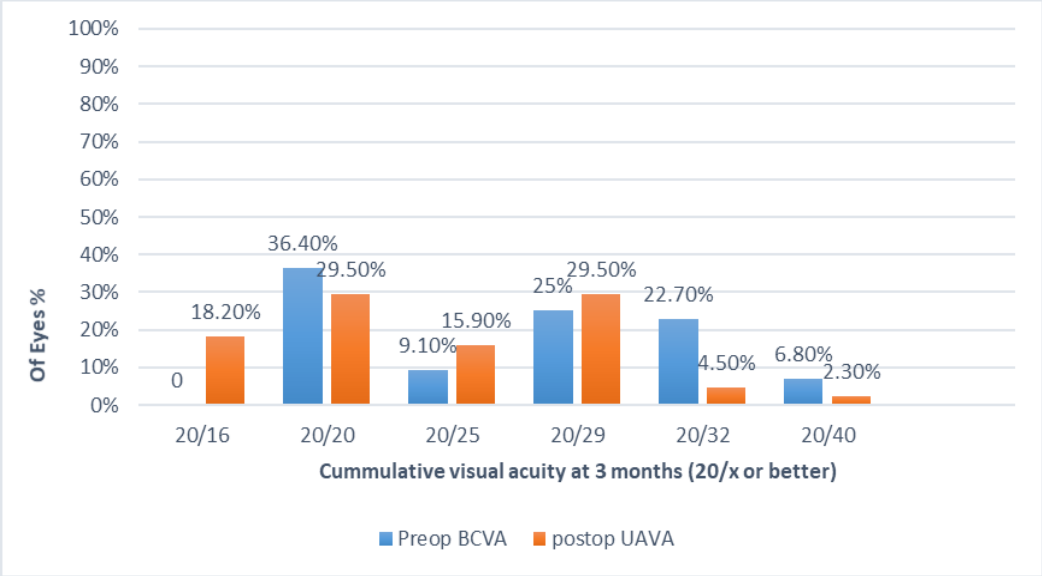

Figure 1. Comparison of Preoperative best-corrected visual acuity (BCVA) and postoperative unaided visual acuity (UAVA)

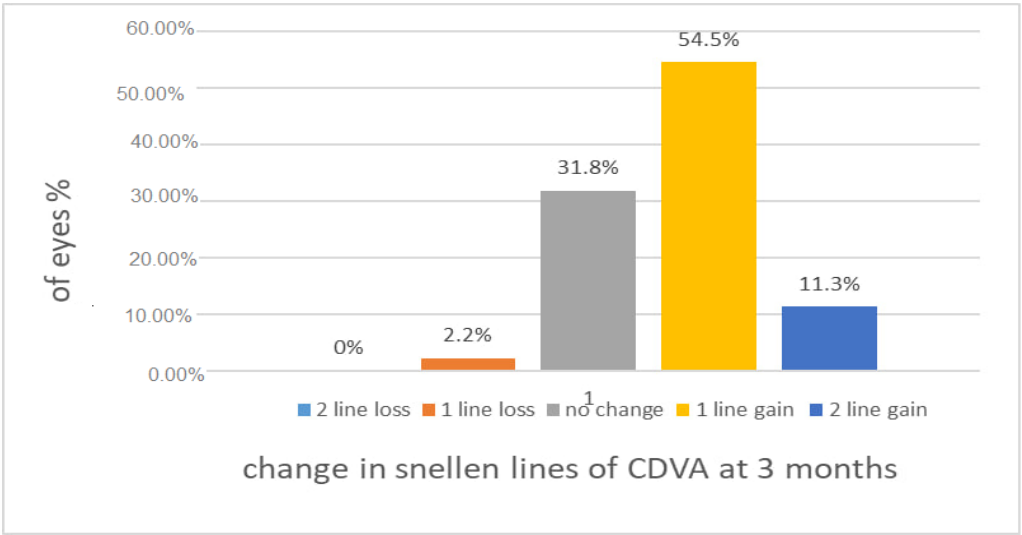

Figure 2. Change in Snellen lines of CDVA at 3 months postoperatively

DISCUSSION

As shown in previous studies, TransPRK treatments are safe and effective for correcting myopia, with or without astigmatism [6-8]. Our research findings demonstrate that TransPRK effectively addressed myopic astigmatism in patients. The treatment outcomes rely on data regarding epithelial thickness (55 µm centrally and 65 µm peripherally), without pre-procedure epithelial mapping for any patients. Additional research is needed to establish the Trans PRK assisted by epithelial mapping and intraoperative Mitomycine-C usage to prevent postoperative corneal haze.

After laser vision correction, gaining one or more lines is due to the canceling of image minification and other aberrations caused by the minus lenses used during preoperative best-corrected visual acuity testing. Clinical outcomes, corneal haze[9], and dry eye [10] were assessed using grades of corneal haze and tear breakup time, respectively. Further research is required in our country.

Our limitation in this study is that the follow-up duration was relatively short—three months postoperatively. Previous research indicates that there are no notable discrepancies between wavefront-optimized and corneal wavefront-guided TransPRK for treating myopic astigmatism. This holds for the manifest refractive spherical equivalent (MRSE) or cylinder measurements at 1-, 3-, and 6-months post-surgery [11].

CONCLUSION

Trans PRK is a promising, safe technique that can improve visual quality and refractive factors and is an effective choice for myopia management.

Conflicts of Interest

The authors reported no potential conflict of interest.

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النتائج السريرية والبصرية لعملية قطع القرنية الضوئية الانكسارية عبر الظهارة بعد تصحيح قصر النظر في عيادة خاصة في بنغازي باستخدام جهاز شويند أماريس

مصطفى العوامي*، حماد الزروق

قسم العيون، كلية الطب، جامعة بنغازي، بنغازي، ليبيا

المستخلص

تهدف هذه الدراسة إلى تقييم نتائج تصحيح قصر النظر من خلال عملية استئصال القرنية الضوئية الانكسارية عبر الظهارة التي يتم إجراؤها باستخدام آلة شويند أماريس. تم تضمين ما مجموعه 44 عينًا في هذه الدراسة المستقبلية. كانت كرة ما قبل الجراحة بين (-1.25 و-8.00 DS)، في حين تراوحت ديوبتر الأسطوانة قبل الجراحة من (-0.75 إلى -5.00 DC). قبل الجراحة وبعد ثلاثة أشهر، أجريت قياسات لتقييم حدة البصر عن بعد غير المصححة والمصححة. ركزت الدراسة على النتائج السريرية والبصرية. بعد مرور ثلاثة أشهر على استئصال القرنية الضوئية الانكسارية عبر الظهارة، كان للعينين المشمولتين حدة بصرية غير مصححة أفضل من أو مماثلة لحدة البصر عن بعد المصححة قبل الجراحة؛ لم يظهر أي مريض فقدان سطرين. وحافظ 31.8% (14 عيناً) على نفس المستوى؛ 54.5% (24 عينًا) تحسنوا بخط واحد؛ 11.3% (خمس عيون) تحسن بخطين؛ والنسبة المتبقية 2.2% (عين واحدة) كان بها نقصان بمقدار خط واحد. يُظهر فحص المصباح الشقي بعد العملية الجراحية شفاء ظهاري كامل خلال خمسة أيام، لكن 4.35% فقط (مرشح واحد) يظهر ضبابًا مركزيًا من الدرجة الأولى. استئصال القرنية الضوئية الانكسارية عبر الظهارة هو خيار موثوق وفعال لإدارة قصر النظر بأمان.

الكلمات الدالة. استئصال القرنية الضوئي عبر الخلايا الظهارية، جراحة القرنية الانكسارية، قصر النظر، الاستجماتيزم.