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The effect of previous soft contact lens wear on corneal refractive surgery outcomes☆

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ABSTRACT

Purpose: To examine the influence of previous soft contact lens (SCL) wear on corneal refractive surgery (CRS) outcomes when SCL wear is ceased for two weeks versus twenty-four hours, and also when compared to no wear, prior to CRS.

Methods: A retrospective examination of CRS patient records was carried out for two groups of patients- who ceased SCL wear for two weeks (n = 45) and for twenty-four hours (n = 49) prior to CRS and compared to a non-contact lens (NCL) control group (n = 45 and n = 49, respectively). CRS outcomes (efficacy, predictability, visual acuity and refractive error) were compared pre-operatively and one and six months post-operatively.

Results: One month post-operative results found unaided distance visual acuity (UDVA) was significantly better for LASEK/PRK patients who had ceased SCL wear for two weeks prior to CRS (-0.05 ± 0.09), compared with the NCL group (0.02 ± 0.09; $p = 0.04$). Furthermore, six month post-operative results found UDVA was significantly better for both LASIK and LASEK/PRK patients who had ceased SCL wear for two weeks prior to CRS, and for LASEK/PRK patients who had ceased SCL wear for twenty-four hours prior to CRS compared with the NCL group.

Conclusions: Given the current setup and methods followed, it was concluded that previous SCL wear had no negative impact on visual outcomes following CRS compared with a NCL control group, regardless of previous SCL cessation time prior to CRS.

1. Introduction

Corneal refractive surgery (CRS) involves ablation of stromal tissue to change corneal curvature and thickness, thereby correcting refractive error of the eye [1,2]. Patient satisfaction with the post-operative outcomes is dependent on the ability of the procedure to achieve emmetropia and maintain levels of unaided distance visual acuity (UDVA), which are similar to preoperative levels of best-corrected spectacle visual acuity (BCSVA) [3]. The outcomes of CRS are dependent on the accuracy of the pre-operative topographic and pachymetry measurements which aid to determine the appropriateness of the CRS procedure chosen. SCL wear has been found to result in significant changes to mean keratometry, corneal astigmatism and corneal eccentricity [4]. SCL- induced corneal oedema results in increased corneal thickness in response to hypoxia, and over long periods of time, SCL wear can result in chronic changes to corneal metabolism such as endothelial polymegathism and corneal thinning [5,6] Therefore, these pre-operative measurements may be negatively affected by soft contact lens (SCL) wear [7,8]. Thus, resulting in increased light scatter, less light transmission and may affect corneal healing [9,10].

The time required for resolution of corneal changes can vary according to the SCL material, in particular oxygen transmissibility, modality and length of previous SCL wear and can be longer than two weeks [11–14]. Despite these variations in effects relating to the properties of the SCL materials worn, prior to CRS, recommended cessation times can vary according to the regulatory body. While no specific guidelines are given in relation to SCL type, modality or wearing time, the United States Food and Drug Administration guidelines recommend that SCLs be left out for at least two weeks prior to initial consultation [15]. Whereas, the Royal College of Ophthalmologists in the United Kingdom recommend removing SCL for one day before consultation, but does not specify how long to cease SCL wear prior to the CRS procedure [16].

A review of the literature, revealed no known links between previous SCL wear and complications or risks associated with CRS. Furthermore, no previous study had investigated the influence of SCL

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Table 1
Preoperative demographic, VA and refraction parameters.

	LASIK			LASEK/PRK		
2 weeks SCL cessation group						
	SCL (n = 23)	NCL (n = 23)	Sig	SCL (n = 22)	NCL (n = 22)	Sig
LogMAR VA	−0.13 ± 0.06	−0.13 ± 0.04	0.19	−0.13 ± 0.05	−0.10 ± 0.07	0.25
Sphere, D	−3.72 ± 1.84	−2.43 ± 1.65	**0.01**	−3.75 ± 1.50	−2.68 ± 1.30	**0.01**
(range, median)	(−1.25 to −7.25, −3.75)	(−1.00 to −9.00, −2.00)		(−1.00 to −5.75, −3.75)	(−1.25 to −6.75, −2.38)	
Cylinder, D	−0.61 ± 0.25	−0.66 ± 0.36	0.80	−0.55 ± 0.25	−0.60 ± 0.32	0.68
(range, median)	(-0.25 to −1.00, −0.50)	(−0.25 to −1.50, −0.50)		(−0.25 to −1.25, −0.50)	(−0.25 to −1.25, −0.63)	
MSE, D	−3.97 ± 1.84	−2.75 ± 1.66	0.01	−3.98 ± 1.43	−2.95 ± 1.33	0.02
(range, median)	(−1.25 to −7.50, −4.00)	(−1.13 to −9.25, −2.50)		(−1.38 to −6.13, −3.81)	(−1.63 to −7.00, −2.63)	
Age (years)	32.6 ± 7.5	36 ± 9.6	0.16	31.4 ± 8	37.2 ± 11	0.22
(range)	(21 to 49)	(23 to 57)		(21 to 49)	(23 to 58)	
Sex (%) Males: Females	48: 52	52: 48		54.5: 45.5	77: 23	
24 h SCL cessation group						
	SCL group (n = 33)	NCL group (n = 39)	Sig	SCL group (n = 16)	NCL group (n = 10)	Sig
LogMAR VA	−0.11 ± 0.02	−0.10 ± 0.03	0.14	−0.10 ± 0.03	−0.10 ± 0.01	0.74
Sphere, D	−3.52 ± 1.47	−2.24 ± 1.47	**< 0.00**	−3.42 ± 1.68	−3.05 ± 1.35	0.56
(range, median)	(−0.75 to −7.00, −3.50)	(−0.50 to −6.25, −1.75)		(−1.00 to −6.75, −3.25)	(−1.00 to −5.50, −2.88)	
Cylinder, D	−0.52 ± 0.35	−0.67 ± 0.36	0.08	−0.61 ± 0.40	−0.48 ± 0.30	0.37
(range, median)	(0 to −1.50, −0.50)	(−0.25 to −1.50, −0.50)		(−0.25 to −1.50, −0.50)	(0 to −1.00, −0.50)	
MSE, D	−3.78 ± 1.46	−2.57 ± 1.46	**< 0.00**	−3.73 ± 1.78	−3.29 ± 1.38	0.51
(range, median)	(−1.13 to −7.38, −3.63)	(-0.88 to −6.38, −2.00)		(-1.25 to −7.13, −3.50)	(−1.38 to −5.75, −2.94)	
Age, years	30.2 ± 8.3	34.8 ± 8.9	0.03	28.0 ± 5.2	30.9 ± 8.1	0.27
(range)	(20 to 55)	(20 to 58)		(21 to 44)	(19 to 48)	
Sex, % Males: Females	30.3: 69.7	61.5: 38.5		60.0: 40.0	56.3: 43.8	

Mean ± SD, range and median of pre-operative demographic and refractive parameters. Mann-Whitney *U*-test (2 weeks cessation group) and two-way ANOVA test (24 h cessation group), significant differences ($p < 0.05$) are shown in bold text.

wear on outcomes of CRS procedures. The appropriate choice of CRS ablation profiles are based on precise pre-operative corneal topography measurements. If these measurements are inaccurate, due to instability associated with SCL wear, CRS outcomes may be negatively affected. To test this hypothesis, the influence of SCL wear on the outcomes of CRS was explored following two SCL cessation times (two weeks and twenty-four hours) and compared to a non-contact lens (NCL) control group.

2. Methods

This was a retrospective, non-masked analysis on data from a group of patients (n = 188), who underwent Laser in-situ Keratomileusis (LASIK) or Laser epithelial keratomileusis (LASEK)/Photorefractive keratectomy (PRK). Stability of the patient's refractive status was assessed by comparing the manifest refraction pre-operatively to the patient's prescription from two years previously. Less than 0.50D change (< 0.25D for those aged 21 years and younger) over the previous two years was termed stable [17–19]. PRK involved complete removal of the corneal epithelium [20–22]. During LASEK, an alcohol solution was used to loosen the epithelial layer, which was then removed as a single flap of tissue and replaced following stromal ablation [23,24]. During LASIK, a corneal flap of predetermined thickness was resected using a femtosecond LASER [22]. Ablation was performed on the exposed stroma using an Excimer Laser which ablated the sub-basal nerves, Bowman's layer and a variable amount of stromal tissue depending on the change in prescription being attempted [25]. Informed consent was obtained from patients to allow their data to be used anonymously for the purpose of research. This study was approved by the Ethics Committee of the Dublin Institute of Technology, and it adhered to the tenets of the Declaration of Helsinki [26].

CRS outcomes were compared between two groups of patients-those who ceased SCL wear for two weeks (n = 45) and those who ceased SCL wear for twenty-four hours (n = 49) prior to CRS and compared to respective NCL control groups (n = 45 and n = 49). Two control groups were separately compared to each test group in order to ensure the test conditions were matched and to satisfy the criteria for two-way ANOVA statistical testing [27]. The inclusion criteria for this study involved myopic patients (range of myopia: two weeks cessation group SCL −1.00 to −7.25D, NCL −1.00 to −9.00D, twenty-four hours cessation group SCL −0.75 to −7.00D NCL −0.50 to −6.25D) with low astigmatism (< 2.00DC) who wore spherical SCLs only, were free from systemic and ocular disease and had no history of ocular surgery. Dominant eyes only were analysed in order to account for the correlation between eyes, thus avoiding overstatement of the validity of statistical analyses [28]. Ocular dominancy was tested using the Dolman method, asking the patient to look towards a distant target through a hole in a piece of card held by both hands at arm's length, the eyes were covered in turn to determine which eye could still see the target [29]. Full-time SCL wearers were included (those wearing SCLs at least five days per week for at least one year prior to enrolment) and the control group had no history of previous contact lens (CL) wear.

This study focused on visual acuity (unaided distance visual acuity [UDVA] and best-corrected spectacle visual acuity [BCSVA]) and refractive error measurements taken pre-operatively and one and six months post-operatively. Quantitative comparison of the variations between the expected and actual changes in vision and refractive results was carried out between the groups in terms of efficacy and predictability. Efficacy was determined by assessing UDVA and manifest refraction values. The efficacy index was calculated as the ratio of the