Original Article

Visual Outcomes with Spectacles

Evaluation of Visual Outcomes with Spectacles After Corneal Cross-Linkage Procedure

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ABSTRACT

Objective: To evaluate the visual outcome with spectacles after corneal cross linkage (CXL) in Keratoconus patients

Study Design: A prospective experimental study

Place and Duration of Study: This study was conducted at the Cornea clinic, Isra Postgraduate Institute of Ophthalmology, Al-Ibrahim Eye Hospital, Karachi from January 2019 to August 2019.

Materials and Methods: 74 patients with progressive keratoconus of age 12 years to 40 years, central corneal thickness more than 400microns and without prior history of CXL corneal procedure were included in the study. Preoperative assessment was based on history, examination and investigations. Operative procedure was performed and postoperative assessment of visual outcomes and complications were noted.

Results: A highly substantial difference of <0.001 existed between pre-operative and post-operative assessment of patients for Un-Corrected Visual Acuity (UCVA). At 3 months post-operatively, the 6/6 visual acuity was observed in 29.7% of patients with spectacles. A highly significant difference of <0.001 existed between pre-operative and 3rd month post-operative examination for Best Spectacle Corrected Visual Acuity (BSCVA). The mean corneal thickness was440 ± 44.34, 429.44 ± 40.52 and 435.45 ± 43.14 at pre-operatively, 1st month post-operative, and at 3rd month. And this exhibits a statistically significant difference of $p<0.001$ between them

Conclusion: Considerably enhancement observed in the visual outcome and BSCVA of keratoconus patient treated with corneal cross-linkage process with no complications.

Key Words: Visual Acuity, Keratoconus, Spectacle, Corneal Collagen

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INTRODUCTION

Keratoconus is a bilateral and symmetrical progressive medical condition in which the cornea is focally thinned and protruded, ultimately then escalating to a cone-shaped surface[5]. The prevalence of keratoconus among people of subcontinent (Pakistan, Bangladesh and India) is found to be about 4.4-7.5 times greater than those of Caucasians[1-2]. Male gender has also found to be at higher risk in recently published data[3-4].

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Various risk factors include allergy, atopy, area of origin, connective tissue diseases, Down's syndrome, Leber's congenital amaurosis, eye rubbing along with familial causes[6-7]. Keratoconus presents with decreased vision and altered refractive powers due to disfigurement of the curvature of the corneal surface[8]. Keratoconus morphology has been described as nipple cones, with 5-mm diameter; oval cones, with 5 to 6-mm diameter; and globus cones, with greater than 6-mm diameter, in the literature[9].

In patients with keratoconus, up till now the recent, choice of treatment was rigid contact lens, spectacles or intra-corneal ring segment for improving visual acuity, but none of them altered the cause of disease which led to advancement in disease and lastly needed corneal transplantation. Keratoconus remained one the leading cause of corneal grafts. With the introduction of corneal collagen cross-linking, a decrease or halting of keratoconus progression has been reported[10-11]. Slowing of disease progression has been associated with increase in collagen stability within the corneal[12]. Through the use of keratometric measurements, either with topographer or manual keratometer, progression or dissolution of keratoconus can be measured. The progression occurs upto the third or fourth decade of

life after which the disease usually comes to a standstill[13].

Before beginning the treatment, eye needs to be evaluated fully as in any other ocular condition. The most important diagnostic procedures include corneal topography and tomography which are used to assess corneal steepening, epithelial imaging and examination of the anterior segment. They give real time information regarding both the anterior as well as the posterior surfaces of cornea[14-16].

MATERIALS AND METHODS

After taken an ethical approval of concern body this experimental study was conducted at Isra Post graduate institute of Ophthalmology (Al-Ibrahim eye hospital). The duration of this study was of six months. After taken written informed consent the data was collected at pre-operative and post-operative stages through Non-probability convenient sampling.

Subjects with Progressive keratoconus of ages range 12 to 40 years, Central corneal thickness more than 400microns and without prior history of CXL corneal procedure included while patients with Other corneal progressive ecstatic disorder, Severe corneal scaring or opacification on the clinical basis or history of: attack of acute hydrops concurrent ocular infection sever ocular surface disease like dry eye were excluded in this study.

Total 74 subjects were enrolled. Pre-operative examination included detailed history of patient, detailed ophthalmic examination, and Corneal Tomography was done After that Corneal cross linkage (CXL) procedure was carried out. This process was carried out by operating microscope, CXL UV laser machine, lid speculum, corneal forceps, tying forceps, and blade number 15, Cotton bud, 10 cc syringe.

RESULTS

Among 74 subjects equal gender distribution of mean age 22.41± 6.10 was observed.

Frequency of the eye side operated shown in Table 1

In this study, measures of Un-Corrected Visual Acuity (UCVA) showed a significant difference pre-operatively and 3rd month post-operatively (Table 2). A substantial difference was also observed in pre-operative and post-operative measurement 3rd month of Best Spectacle Corrected Visual Acuity (BSCVA) (Table 3).

Table No.1: Frequency of side of eye operated

Variable		N	%
Eye	Right	39	52.7
	Left	35	47.3

Table-2: Comparison of Best Spectacle Corrected Visual Acuity at pre, 1st and 3rd month post-operative state

Variables		Preoperative		Postoperative 1st month		Postoperative 3rd month		p-Value
		n	%	N	%	n	%	
Best Spectacle Corrected Visual Acuity (BSCVA)	6/60	s	2.7	1	1.4	1	1.4	<0.001
	6/36	9	12.2	6	8.1	2	2.7	
	6/24	11	14.9	6	8.1	2	2.7	
	6/18	8	10.8	15	20.3	18	24.3	
	6/12	5	6.8	7	9.5	10	13.5	
	6/9	16	21.6	22	29.7	19	25.7	
	6/6	23	31.1	17	23.0	22	29.7	

Table No.3: Comparison of un-corrected visual acuity during pre, 1st and 3rd month post-operatively phase.

Variables		Preoperative		Postoperative 1st month		Postoperative 3rd month		p-Value
		n	%	N	%	n	%	
Un Corrected Visual Acuity (UCVA)	1/60	8	10.8	6	8.1	6	8.1	<0.001
	2/60	20	27.0	16	21.6	15	20.3	
	3/60	4	5.4	2	2.7	3	4.1	
	4/60	0	0.0	2	2.7	2	2.7	
	5/60	3	4.1	0	0.0	0	0.0	
	6/60	6	8.1	10	13.5	9	12.2	
	6/36	10	13.5	8	10.8	7	9.5	
	6/24	4	5.4	10	13.5	8	10.8	
	6/18	5	6.8	6	8.1	7	9.5	
	6/12	8	10.8	6	8.1	8	10.8	
	6/9	3	4.1	5	6.8	5	6.8	
	6/6	3	4.1	3	4.1	4	5.4	

A significant difference was observed between pre-operative and 1st month post-operative measurement of Best Correct Visual Acuity with Contact Lenses (BCVACL). At first Keratometric measurement pre-operatively and 1st month post-operatively, a significant difference was reported.

Similarly, in pre-operative and 3rd month post-operatively, a significant difference was reported. At second Keratometric measurement, substantial difference was recorded between pre-operative and 1st month post-operatively as well as pre-operative and 3rd month post-operatively. The maximum keratometric measurement at pre-operative, 1st month post-operative and 3rd month post-operative demonstrated insignificant difference between them. A significant decrease in pre-operative, 1st month post-operative and 3rd month post-operative corneal thickness was reported.

DISCUSSION

In accordance to our study, a study by Wittig-Silva et al conducted on 66 eyes of 49 patients undergoing Corneal Collagen Cross-linking (CXL) due to keratoconus reported a significant difference between maximum Keratometry (of 0.74 diopters) at pre-operative and 3rd month post-operative (p-value 0.004). BSCVA was also reported to improve at 3rd month post-operatively as compared to pre-operative state[17]. Another study conducted by Fadlallah et al, on 16 eyes of 10 patients of keratoconus, a substantial difference of 0.001 was observed in keratometry measured at baseline (50.02 ± 4.07) to keratometry measured at 6th month post-operatively (48.74 ± 4.05). The BCVA improved post-operatively at 6th month as compared to baseline[18]. The above findings were similar to our study although the follow up period in our study was 3 months and in the above study it was 6 months. Wittig-Silva et al, reported in a study on 46 keratoconus eyes undergoing CXL reported a mean decrease in maximum keratometry of 1.20 ± 0.28 diopters at 3rd month post-operatively as compared with baseline, being statistically significant (p-value 0.001). The mean UCVA change at 3rd month from baseline (0.15±0.06) was reported to be significant (p-value 0.009). Similarly mean change in BSCVA improved at 3rd month (0.09±0.03) as compared with baseline, showing a significant p-value of 0.006[19]. Similar results were also reported in the present our study. Keratoconus is typically observed to commence at puberty and progresses till the third or fourth decade of life. Variation in keratoconus progression is seen in-between individuals and usually higher in young patients. The disease tends to stabilize approximately 20 years following initial presentation[20]. Differences of age, genetic makeup, socio-economic background, operative facilities all tend to have an impact on visual outcomes of keratoconus after CXL. In accordance with our study, Raiskup-Wolf et al, in a study with a follow up time of 6 years on 241 patients undergoing CXL for keratoconus, a significant mean improvement of 2.44 D was observed[21]. Similarly, Jankov et al, in another study on 25 patients having a mean age of 28 years, reported a substantial improvement of 2.14 D 6 months after CXL for keratoconus[22]. Likewise, Vinciguerra et al reported a substantial 1.35 D improvement in maximum keratometry after CXL for keratoconus in 28 patients with ages ranging from 24-52 years. The maximum follow up time period was 2 years[23]. In another study by Agrawal et al, on 37 keratoconus patients undergone CXL reported a significant 2.47 D improvement in maximum keratometry after 1 year of follow up[24]. Coskunseven et al in a study on 19 patients having mean age of 22 years reported asubstantial mean improvement of 1.57 D in maximum keratometry after a follow up of 1 year[25]. In a study by Koller et al on 117 patients of keratoconus a significant improvement in mean keratometry post-CXL was observed after 1 year of follow up[26]. El-Raggal in another study on 15 patients of keratoconus having mean age of 26.4 years reported an improvement of 1.63 D 6 months after CXL[27]. Similar to our study, Koller et al, reported a significant improvement of 0.89 D 1 year after CXL in 192 patients of keratoconus having a mean age of 29.3 years[28].

In accordance to our study, Derakhshan et al, in a study on 31 patients having a mean age of 22.3 years with keratoconus reported a substantial mean improvement of 0.65 D at 6 months follow up after CXL[29]. Asri et al reported a significant mean improvement of 0.49 D 1 year after CXL due to keratoconus in 142 patients having a mean age of 24.12 years[30]. In another study by Hersh et al, a substantial mean improvement of 2.0 D was seen in 49 patients undergoing CXL after 1 year of follow up[31]. Viswanathan et al reported in their study on 51 patients of keratoconus followed up for 4 years after CXL, a significant mean improvement of 0.96 D[32]. Age, gender, socio-economic status, genetic makeup, period of follow-up time all tend to effect in visual outcome of patients with keratoconus who have undergone CXL. But overall, all studies have reported improvements in the overall visual outcomes of patients, no matter what differences exist between each study.

CONCLUSION

It is concluded that collagen corneal cross linkage resulted in the considerable enhancements in the visual outcomes of keratoconus patients. Successful improvements were observed for Un-Corrected Visual Acuity and Best Spectacle Corrected Visual Acuity with no complications after the procedure during the study.

Author's Contribution:

Concept & Design of Study:	Ikramuddin Indhar
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