Keratoconus Subject’s Visual Acuity, Refraction and Pachymetry after Cross-Linking

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The cross-linking treatment is the only treatment whose purpose is to stop keratoconus progression. The procedure is safe and it has been done by increasing corneal tissue rigidity and biomechanical stabilization by additional collagen links in the corneal stroma. The first cross-linking was performed in 1998 [6,11-13]. In the last years researchers have managed to estimate post cross-linking results. The purpose of all the studies is to estimate cross-linking’s stability over many years. Results after treatment were analyzed by changes in $K_{\text{max}}$ (maximal keratometry) value and best corrected visual acuity (BCVA). Results have shown that visual acuity after cross-linking is decreased in the first months, but improvement follows after that (Mastropasque, 2015).

The first clinical study was done by Wollensak in Dresden at 2003 [14]. Later Italian research group made a small study with 10 subjects in 2006. Raiskup-Wolf with colleagues had the most comprehensive study in 2008 [6]. In the study they analyzed the eyes of 241 subjects after cross-linking procedure over six years time. This study has proved the same results as other studies - that subjects after cross-linking have statistically significant improvement in refraction, best corrected visual acuity and keratometry in first 12 month after treatment. Jankov with colleagues have proven that cross-linking stops progressive keratoconus for all subjects [15]. In Jankov’s study reduction in best corrected visual acuity for all subjects was not seen after...
cross-linking treatment. In the study 63% of subjects best corrected visual acuity had not changed, 5% of subjects had one visual acuity line improvement, 26 % of subjects had two lines improvement and 5% subjects had three lines improvement. In Arbelaez [16], Coskunseven [17], Khattak [18], Vinciguerra [19,20], Wittig-Silva studies pachymetry had reduced after cross-linking in the first months [21]. Vinciguerra has found reduction of pachymetry in the first six months followed by increase in one year after cross-linking [19]. Wollensak [14], Caporossi [22], Witting-Silva [21,23], Arbelaez [16], Coskunseven [17], Khattak [18], Hersh [14,24] and Vinciguerra [19,20], Jankov [15,25] have described similar cross-linking results. All of the researchers have seen stabilization of corneal keratometry and corneal thinning in the first year after treatment. All the studies have showed decrease of maximal keratometry, improvement of refraction both in the sphere and in the astigmatism after treatment by improving uncorrected and corrected visual acuity. Keratoconus has stopped if keratometry is reduced by > 1 D in the steepest and flattest cornea, mean cornea is reduced by > 0.75 D, corneas apex keratometry is reduced by > 1 D after cross-linking; spherical equivalent is reduced by 0.5 D and corneal thickness by > 2% [17,20]. Kasai [26] has found that keratoconus subjects with higher keratometry experience higher flattering in cornea's keratometry after cross-linking [26]. Keratoconus subjects with central keratoconus apex localization have better results after cross-linking than subjects with peripheral apex [27-29]. Even if keratoconus subjects have good visual acuity, they have reduced contrast sensitivity due to highest order aberrations. Highest order aberrations reduce (especially coma) and contrast sensitivity increase after cross-linking [30].


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