

Tear MMP-9 Changes After Corneal Cross-Linking in Patients with Keratoconus

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Purpose

To evaluate tear matrix metalloproteinase-9 (MMP-9) levels in keratoconus (KC) patients after accelerated corneal cross-linking (A-CXL).

Methods

This prospective study included 21 eyes of 21 KC patients who underwent epi-off A-CXL with 9 mW/cm² UVA irradiation. Tear samples were collected preoperatively and at postoperative months 3 and 6 using Schirmer strips. MMP-9 was quantified by ELISA. Corneal tomography parameters (K1, K2, Kmean, Kmax, and thinnest corneal thickness [TCT]) were recorded at each visit. Ocular surface assessment included the Ocular Surface Disease Index (OSDI) and noninvasive tear break-up time (NI-BUT).

Results

The mean age was 23.7 ± 3.0 years; 7 patients were female (33.3%) and 14 were male (66.7%). KC stages were stage 1 in 4.8% (n=1) of eyes, stage 2 in 38.1% (n=8) of eyes, stage 3 in 9.5% (n=2) of eyes, and stage 4 in 47.6% (n=10) of eyes. The median tear MMP-9 levels, along with the mean OSDI scores and NI-BUT values, are presented in Table 1. MMP-9 did not differ at month 3 compared with preoperative values (p=0.161) but was significantly lower at month 6 (p=0.010). K2, Kmean, and Kmax decreased at month 6 compared to baseline. TCT decreased at month 3 but was similar to preoperative values at month 6. OSDI scores and NI-BUT values improved after A-CXL.

Table 1. Tear MMP-9 Levels, OSDI Scores, and NI-BUT Values Before and After Accelerated Corneal Cross-Linking

	Tear MMP-9 levels Median (IQR)	OSDI score Mean ± SD	NI-BUT values Mean ± SD
Preoperatively	21.84 ng/ml (IQR 11.95–68.91)	35.84 ± 22.79	9.71 ± 4.53
Post-op month 3	19.56 ng/ml (IQR 8.31–31.99)	17.52 ± 21.90	13.32 ± 3.79
Post-op month 6	14.52 ng/ml (IQR 3.39–27.04)	6.95 ± 7.20	13.40 ± 3.91
p values	0.011	<0.001	0.003

Conclusion

Tear MMP-9, an inflammatory biomarker, was reduced at 6 months after A-CXL. Additionally, there was an improvement in ocular surface symptoms, increased tear film stability, and corneal flattening.