

Clinical Outcomes of Sub400 Protocol and Contact Lens–Assisted Corneal Cross-Linking in Keratoconus with Thin Corneas

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Purpose:

To compare the clinical outcomes of the sub400 protocol and contact lens–assisted corneal cross-linking (CACXL) in keratoconus patients with thin corneas.

Methods:

This retrospective study included 41 keratoconic eyes with intraoperative pachymetry $<400\ \mu\text{m}$: 18 treated with CACXL and 23 with the Sub400 protocol. Tomographic parameters and BCVA were assessed preoperatively and at the 2-year follow-up. Progression was defined as a $\geq 1.0\ \text{D}$ increase in Kmax, regression as a $\geq 1.0\ \text{D}$ decrease, and changes $<1.0\ \text{D}$ as stability.

CACXL²

A riboflavin-soaked soft contact lens was applied to increase intraoperative pachymetry above $400\ \mu\text{m}$, followed by accelerated UVA irradiation at $9\ \text{mW}/\text{cm}^2$ for 10 minutes.

Results:

Sub400 protocol was associated with significant reductions in K2, Kmean, and Kmax and improvement in BCVA, whereas CACXL showed significant reductions in K1, K2, Kmean, and Kmax with stable BCVA and TCT. The magnitude of Kmax change was comparable between groups.

In the Sub400 group;

52.2% of eyes showed regression and 47.8% remained stable.

In the CACXL group,

61.1% of eyes showed regression, 33.3% remained stable, and 5.6% progressed.

- No complications were observed in either group.

Sub400 protocol¹

| Minimum Stromal Required Thickness (mm) | UV Irradiation Duration (min) |
|---|-------------------------------|
| 200 | 1 |
| 210 | 01:20 |
| 220 | 01:40 |
| 230 | 2 |
| 240 | 02:30 |
| 250 | 3 |
| 260 | 03:30 |
| 270 | 4 |
| 280 | 5 |
| 290 | 6 |
| 300 | 7 |
| 310 | 9 |
| 320 | 10 |
| 330 | 12 |
| 340 | 14 |
| 350 | 16 |
| 360 | 18 |
| 370 | 20 |
| 380 | 23 |
| 390 | 26 |
| 400 | 29 |

Conclusion: In keratoconus eyes with thin corneas, both the Sub400 protocol and CACXL achieved comparable stabilization at 2-year follow-up, with no observed complications.