

Efficacy of collagen cross linking (CXL) of human corneal transplants ex vivo: a pilot study.

Schmidinger G.¹, Lammer J.¹, Pircher N.¹, Fischinger I.²

DEPARTMENT OF OPHTHALMOLOGY AND
OPTOMETRY



MEDICAL UNIVERSITY
OF VIENNA



Vienna
General Hospital

¹Medical University of Vienna

²Inselspital Bern, Schweiz

Disclosure: none of the authors have financial interests



MEDICAL UNIVERSITY
OF VIENNA

Background and Purpose:

Penetrating keratoplasty has proven to be a well established and safe procedure for several indications. Common complications involve graft rejection, post-OP astigmatism and melting of the graft.

Our hypothesis is that pre-operative (OP) crosslinking (CXL) of corneal transplants might result in **a higher resistance against melting** and a **reduction of post-OP astigmatism** of the graft.

Purpose of this study was to experimentally assess efficacy of ex-vivo collagen cross linking (CXL) in corneal transplants stored in tissue culture.

Materials and Methods:

- Human donor corneas that were stored in culture medium (Alchemia) were divided into 2 groups:

→ Treatment group:

Riboflavin 0.1% + Dextran 20% was administered to the grafts for 30 minutes followed by 10 minutes of UV-A (365nm; 9mW/cm²) irradiation.

→ Control group:

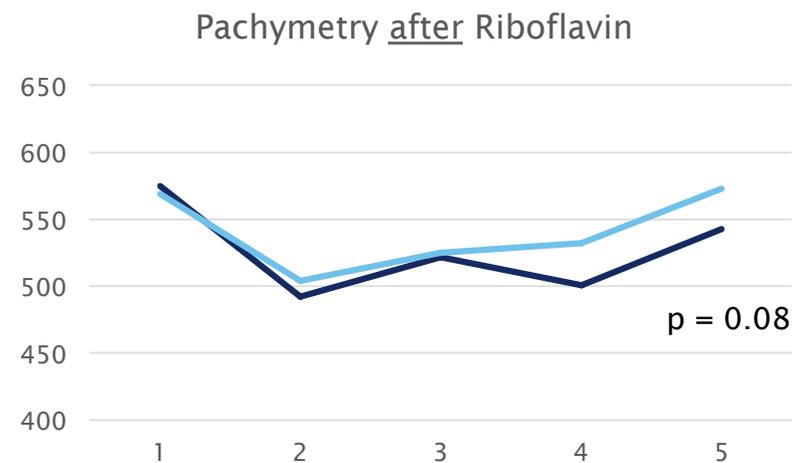
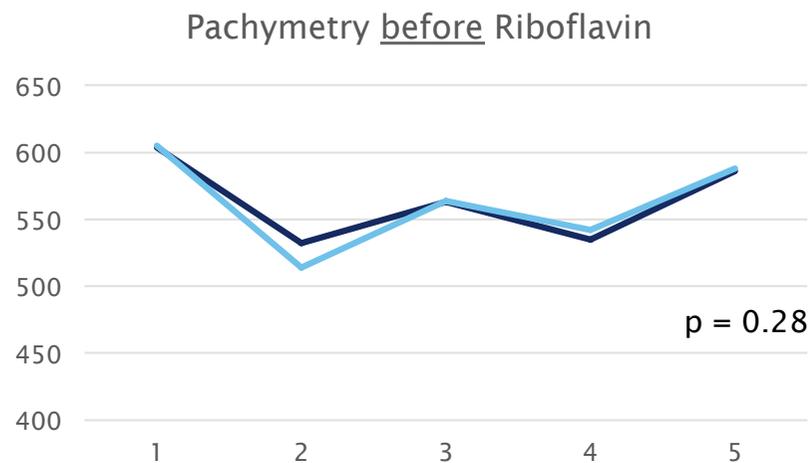
Grafts received sham treatment only (30 minutes of Riboflavin immersion, no irradiation).

- Pachymetry was assessed before and after treatment.
- Stress/Strain measurements of corneal stripes were performed using a custom made uniaxial material tester at strains up to 12%.¹

¹Seiler, Fischinger, Senfft, et al; Intrastromal Application of Riboflavin for Corneal Crosslinking. *IOVS*. 2014;55(7):4261-4265

Results

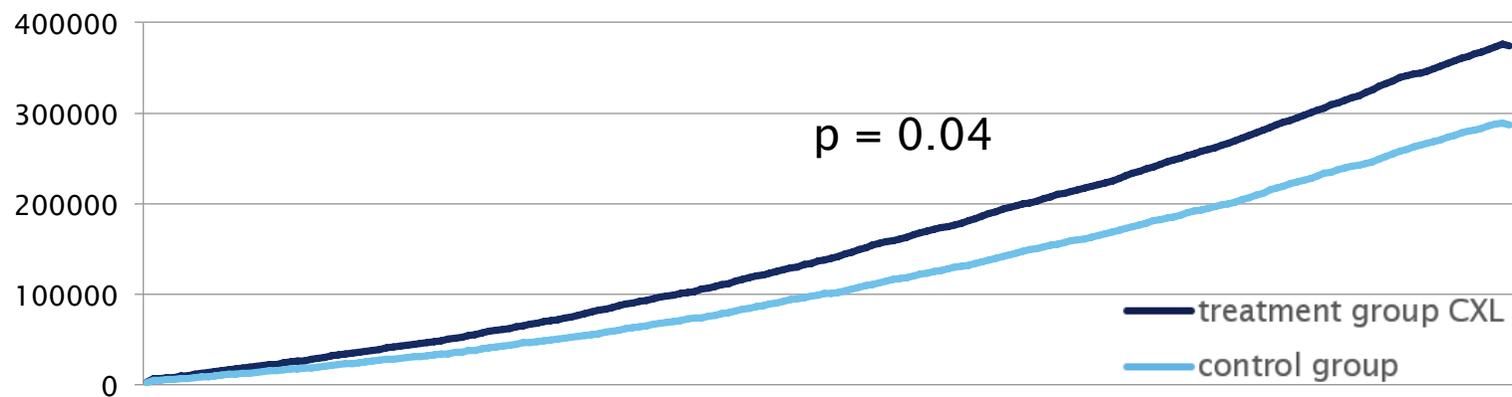
- Ten paired human donor corneas were included. Mean±SD of time in culture was 10.2±5.0 days. Corneas were stored in deswelling Tissue medium for 24-48 h before testing.
- There was no difference in corneal thickness between the two groups investigated



— treatment group CXL
— control group

Results

- Stress needed for a 10% strain was significantly increased by 34% in the treatment group compared to control.



- UV light absorption by storing medium B was negligible.

Medium B	Time of graft in Medium B (in h)	pH	UV absorption at 365nm
without corneal graft	0	7.7	0.025
with corneal graft	24	7.4	0
with corneal graft	96	6.8	0

Conclusion and Discussion

- Ex-vivo **CXL** of corneal grafts stored in organ culture Medium **was successful** in our experimental setting. Donor grafts showed significantly increased corneal rigidity. However, increase of corneal rigidity was lower than described for native corneas in the literature.
- Given that UV light absorption of the used tissue medium at 365 nm was negligible, a lower riboflavin concentration due to medium saturation in the corneal tissue might be the cause.
- Additional studies are underway to assess the introduced procedure in terms of endothelial safety, corneal transparency and reduction of suture induced corneal astigmatism.