

# Cross Linking in Childrens



Mghaieth K, Mahjoub S Ben Amor K, Bouassida B,  
Ben Said A, Trabelsi O, Trabelsi A

Les Ophtalmologistes Associés de Tunis

## Cross Linking / Children

### Stabilisation of Keratoconus

Raiskup F, Theuring A, Pillunat LE, Spoerl E. Corneal collagen crosslinking with riboflavin and ultraviolet-A light in progressive keratoconus: **Ten-year results**. J Cataract Refract Surg. 2015

# Cross Linking / Children

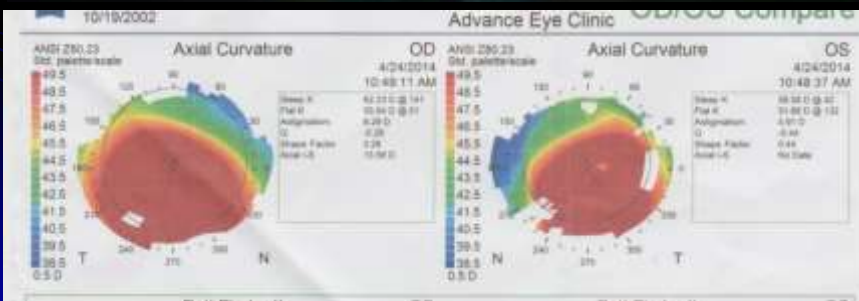
Stabilisation of Keratoconus

Useful Corrected Vision



Scleral lenses reduce the need for corneal transplants in severe keratoconus. Koppen et Al. Am J Ophthalmol. 2017

12 yod 2.5/10 >>> 3,5/10



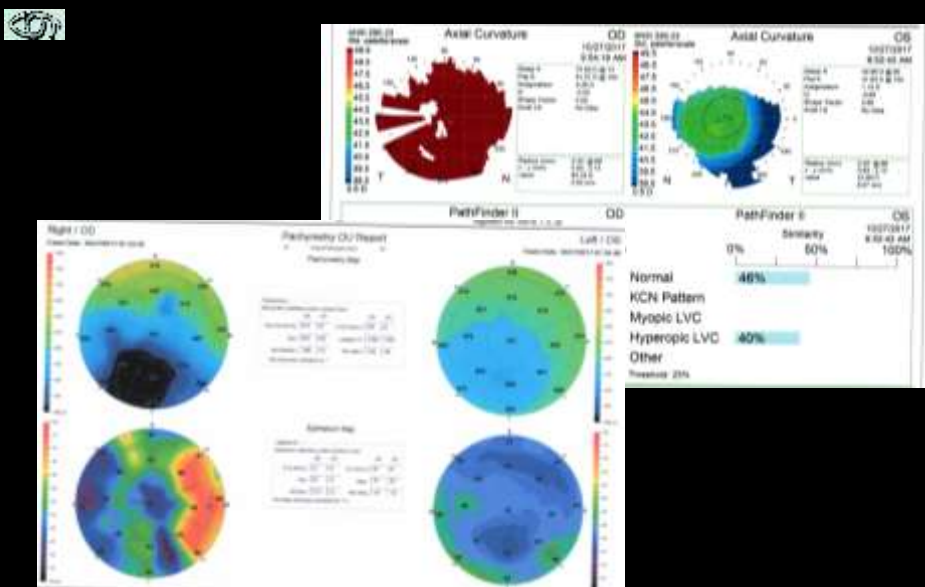
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Stabilisation of Keratoconus

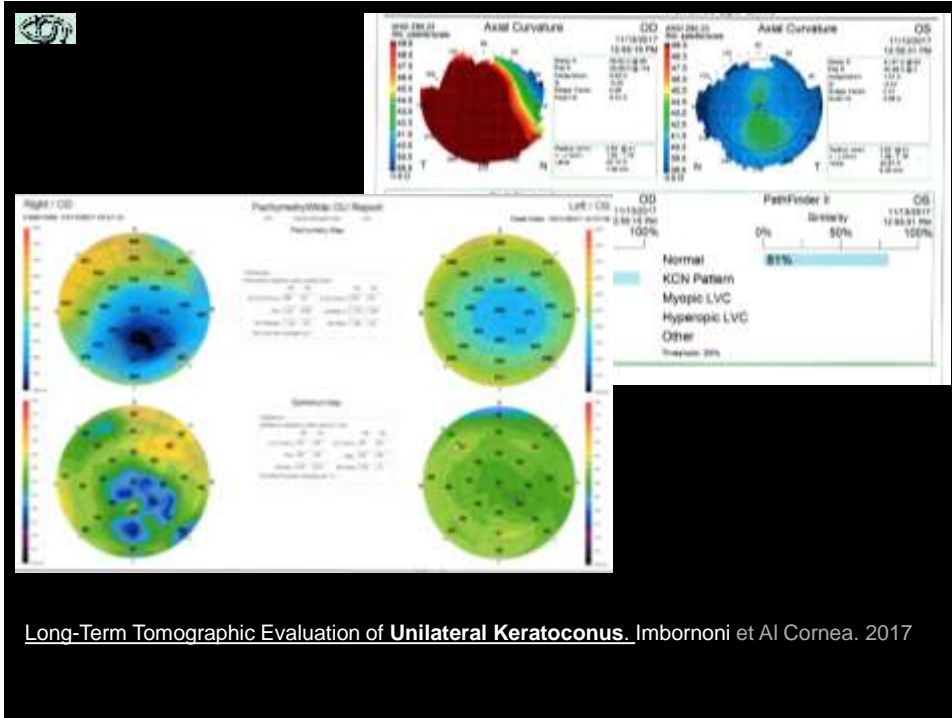
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Progressive keratoconus : Mandatory / Documented

1-Chatzis N<sup>1</sup>, Hafezi F Progression of keratoconus and efficacy of pediatric [corrected] corneal collagen cross-linking in children and adolescents. *J Refract Surg.* 2012 Nov; 88 % progression



Intraindividual Keratoconus Progression. Goebels et Al. *Klin Monbl Augenheilkd.* 2017

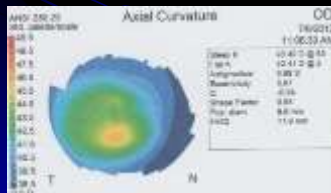


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Stabilisation of Keratoconus

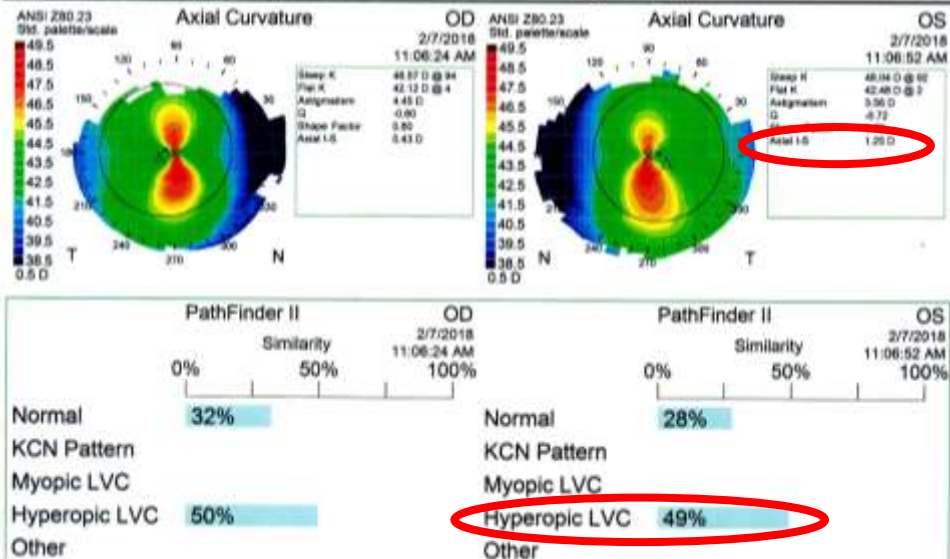
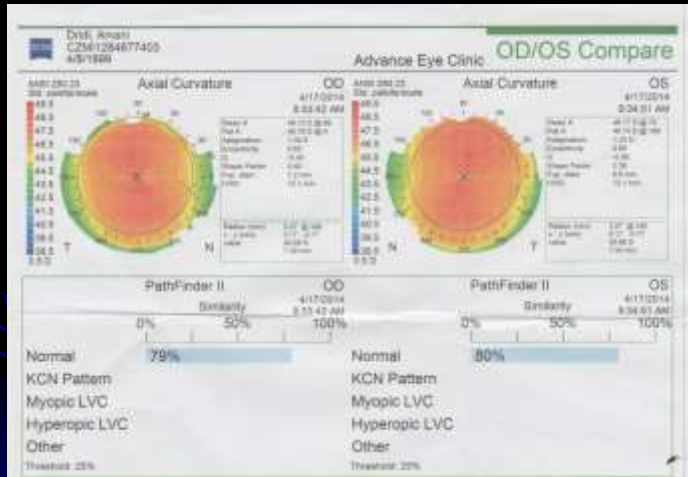
Useful Corrected Vision

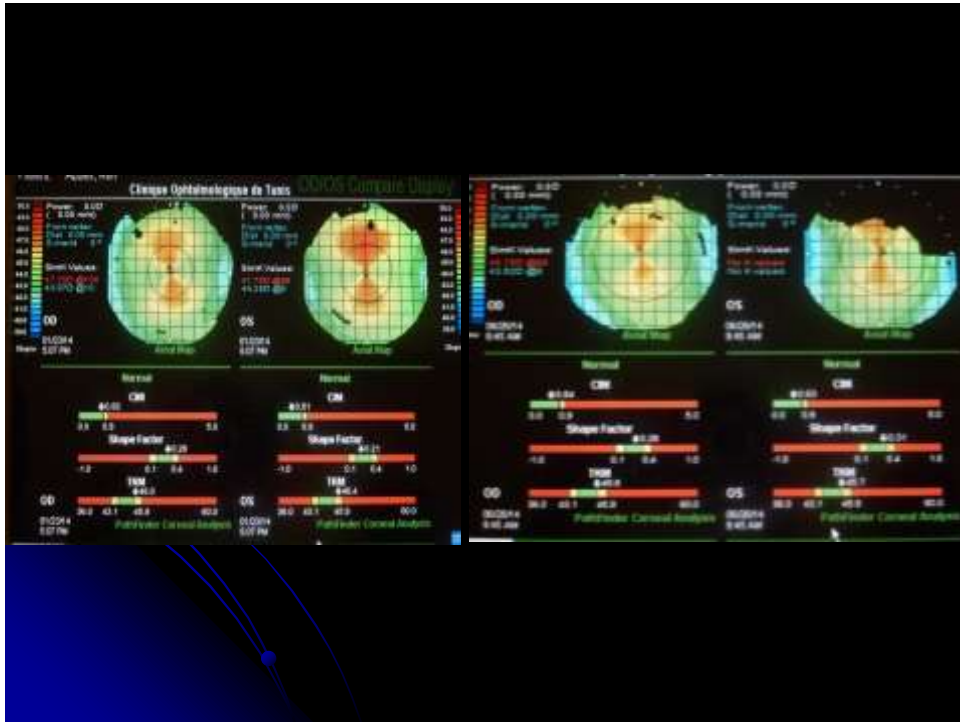
Progressive keratoconus : Mandatory / Documented Clinical > Fruste



1-Chatzis N<sup>1</sup>, Hafezi F Progression of keratoconus and efficacy of pediatric [corrected] corneal collagen cross-linking in children and adolescents. *J Refract Surg.* 2012 Nov; 88 % progression

# Steepening > Asymmetry





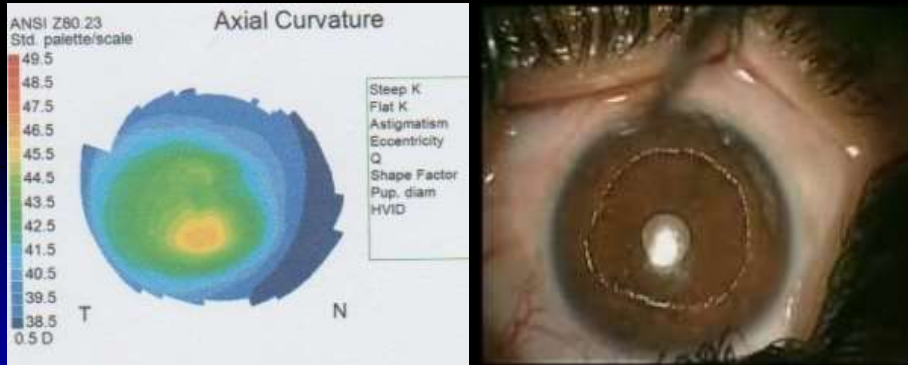
# Dresden Protocol

Epi-off + 30 mn UV



Wollensak G, Spoerl E, Seiler T: Riboflavin/ultraviolet-A-induced collagen crosslinking for the treatment of keratoconus. Am J Ophthalmol 2003;135:620-627

- Cone centred desepithelisation



## Dresden Protocol

Epi-off + 30 mn UV

Longest follow up

Corneal Collagen Cross-Linking for Keratoconus in Pediatric Patients-  
Long-Term Results. Padmanabhan et Al. Cornea. 2017

Cross-linking in children with keratoconus: a systematic review and meta-analysis.  
McAnena et Al. Acta Ophthalmol. 2017

# Dresden Protocol

Epi-off + 30 mn UV

Longest follow up

Efficacy >>> modified protocol

Systematic review and Meta-analysis comparing modified cross-linking and standard cross-linking for progressive keratoconus. Liu et Al. *Int J Ophthalmol.* 2017

- **Thin Cornea:**  
Hypotonic riboflavin  
Without eye speculum



F. Raiskup and E. Spoerl, "Corneal cross-linking with **hypo-osmolar riboflavin** solution in thin keratoconic corneas," *American Journal of Ophthalmology*, vol. 152, no. 1, pp. 28–32, 2011

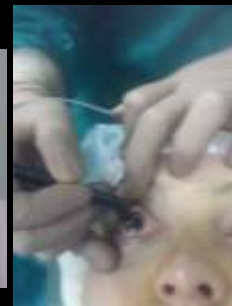


- Check Pachymetry before UV
- **Compensate** : Hypotonic Riboflavin  
Hydratation
- Contact Lens ( no UV filter )



- 1- Chow VW, Biswas S, Yu M, Wong VW, Jhanji V. Intraoperative pachymetry using spectral-domain optical coherence tomography during accelerated corneal collagen crosslinking. *Biomed Res Int*. 2013;2013:848363
- 2- Raiskup, A. Hoyer, and E. Spoerl, "Permanent corneal haze after riboflavin-UVA-induced cross-linking in keratoconus," *Journal of Refractive Surgery*, vol. 25, no. 9, pp. S824–S828, 2009.
- 3- G. D. Kymionis, G. A. Kounis, D. M. Portaliou et al., "Intraoperative pachymetric measurements during corneal collagen cross-linking with riboflavin and ultraviolet A irradiation," *Ophthalmology*, vol. 116, no. 12, pp. 2336–2339, 2009.

- Cooperation



- 1- G. Wollensak, E. Spörl, F. Reber, L. Pillunat, and R. Funk, "Corneal endothelial cytotoxicity of riboflavin/UVA treatment *in vitro*," *Ophthalmic Research*, vol. 35, no. 6, pp. 324–328, 2003.
- 2- Wollensak, E. Spoerl, M. Wilsch, and T. Seiler, "Endothelial cell damage after riboflavin-ultraviolet-A treatment in the rabbit," *Journal of Cataract and Refractive Surgery*, vol. 29, no. 9, pp. 1786–1790, 2003.

3.5 yod (G.A.)

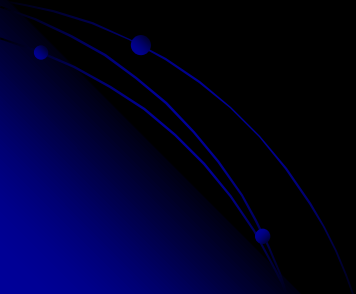


- Bandage contact lens
- Topical steroid + AB + lubricant
- Allergy treatment +++

# PATIENTS

- 35 eyes : follow up > 2 years
- 

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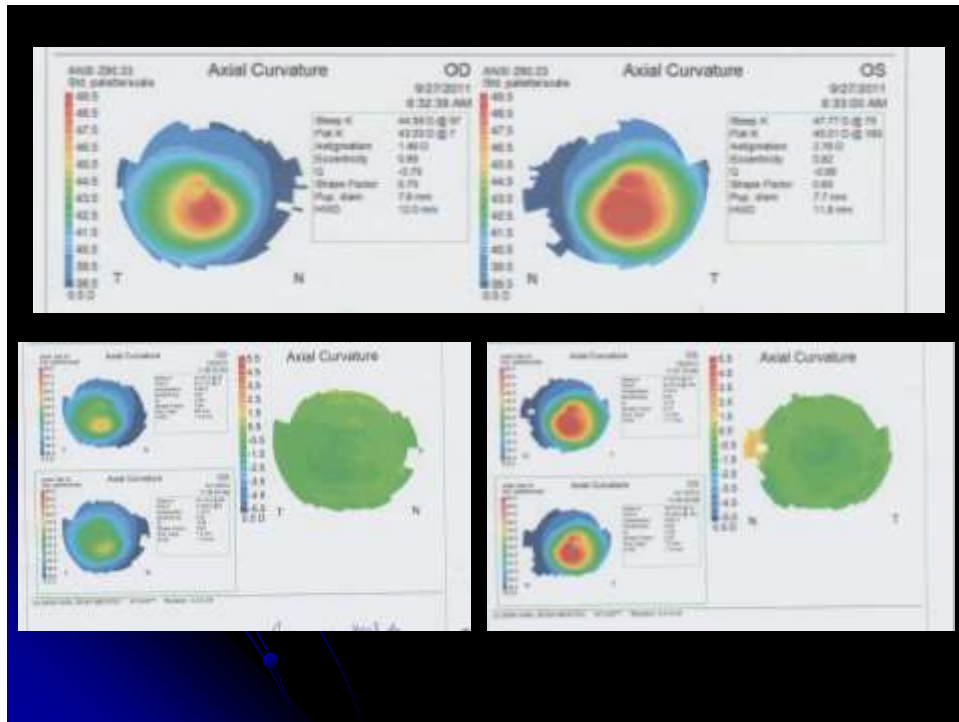
- 35 eyes : follow up > 2 years
  - Age : 13.3 yod ( 3,5- 17 )
- 

# PATIENTS

- 35 eyes : follow up > 2 years
- Age : 13.3 yod ( 3,5- 17 )
- Pachymetry: 453 microns ( 330 - 621)

# RESULTS ( M 12 )

	Préopératoire	Post opératoire	Différence pré et post opératoire	Evolution
Best corrected vision	3,5/10 (2/10 et 8/10)	4,6/10 (2,5 et 9/10)	+ 1 (-1et +3)	-66% amélioration -28% stabilité • <b>4,7 % failure</b>
Kératométry (d)	47,66d (41,87 et 61,5)	46,69 (40,6et 58,5)	-0,97 ( - 4 et + 1,25)	-76% amélioration -14,3 % stabilité -9,5 % echec
Astigmatism (d)	5,06 (0,75 et 10,5)	4,42 (1et 10,25)	-0,67 ( - 5,5 et + 1,5)	-76% amélioration -14,3 % stabilité • <b>9,5 % failure</b>



## Complications post opératoires: Transitoires

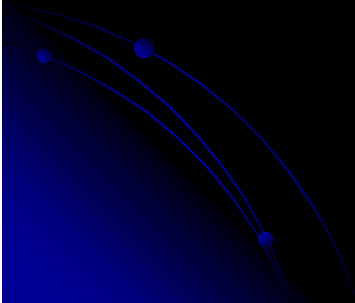
- Retard de cicatrisation épithéliale
- Haze stromal
- Oedème cornéen
- Infiltrats stériles
- Kératite infectieuse.
- Opacités stromales

Seiler TG<sup>1</sup>, Schmidinger G, Fischinger T, Koller T, Seiler T. Complications of corneal cross-linking. *Ophthalmologie* 2013 Jul;110(7):639-44.

Javadi MA<sup>1</sup>, Feizi S. Sterile Keratitis Following Collagen Crosslinking. *Ophthalmic Vis Res*. 2014 Oct-Dec;9(4):510-3.  
Rana M<sup>1</sup>, Lau A<sup>2</sup>, Aralikatti A<sup>1</sup>, Shah S. Severe microbial keratitis and associated perforation after corneal crosslinking for keratoconus. *Cont Lens Anterior Eye*. 2015 Apr;38(2):134-7.

## Crossliking / Childrens

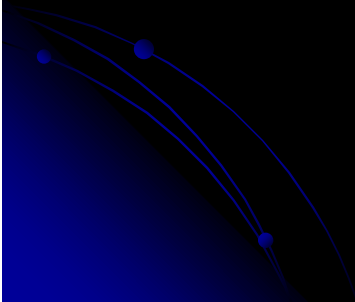
Diagnosis : steepening > assymetry



## Crossliking / Childrens

Diagnosis : steepening > assymetry

Indication : mandatory ? ( fruste keratoconus )



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Dresden protocol : gold standard

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Diagnosis : steepening > assymetry

Indication : mandatory ? ( fruste keratoconus )

Dresden protocol : gold standard

Efficient ( > 90 % ) & safe

Longer follow up