Customized CXL

Long-term results and complications

Theo Seiler

Institut für Refraktive und Ophthalmo-Chirurgie (IROC)
and
University of Zürich

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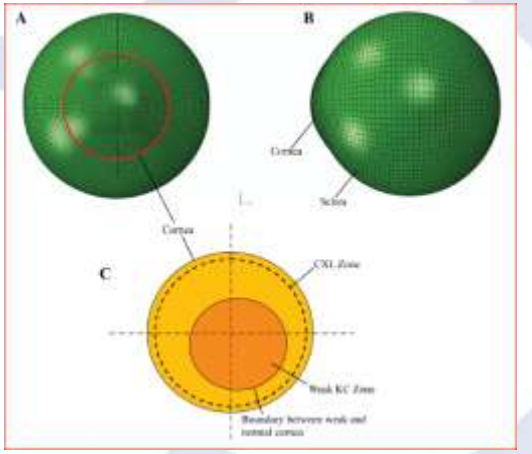

AS Roy and WJ Dupps, IOVS 2011

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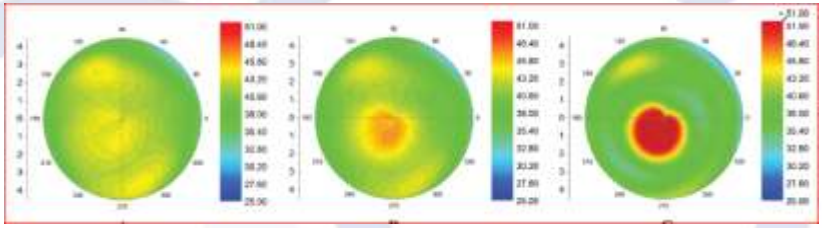
Customized CXL



Reduction of E-module

10% **30%** **45%**

AS Roy and WJ Dupps, IOVS 2011

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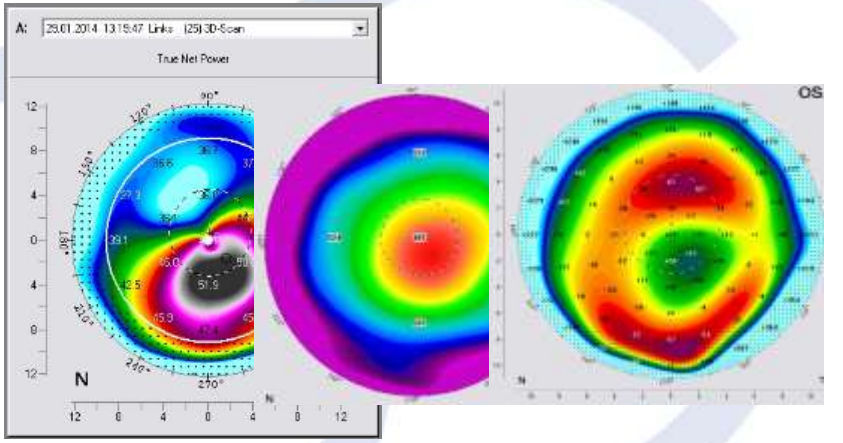
Customized CXL



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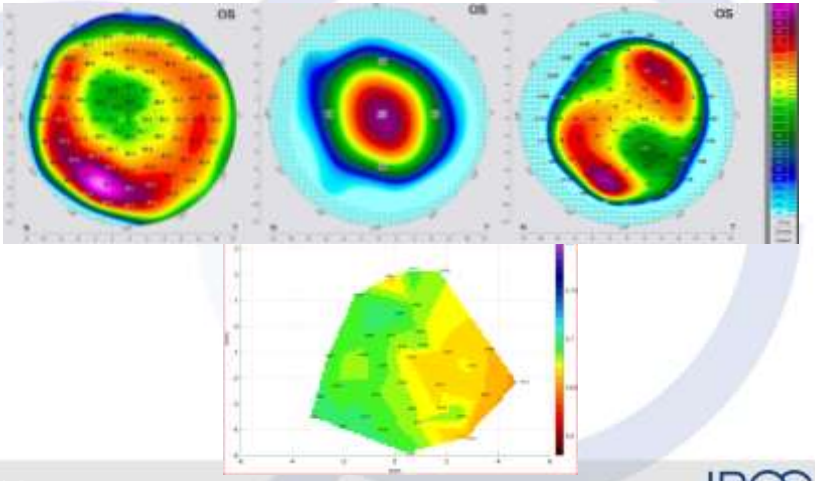
Results

Where is the weakest point in an ectatic cornea?



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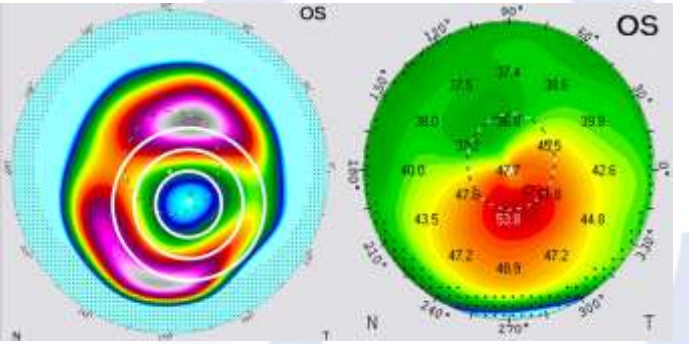
methods

Irradiation pattern area and centration



inner circle: total energy applied 10J/cm² – shortest diameter of PF – 0.5mm

intermediate circle: total energy applied 7.2J/cm² – average diameter of outer/inner circle

outer circle: total energy applied 5.4J/cm² - maximal diameter of PF + 1.0 mm

Irradiance: 9mW/cm²

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UV source

Avedro Mosaic System:

- Irradiances from 9 to 100 mW/cm^2
- Active real-time eye tracking ensuring centration
- Integration of corneal tomography maps
- Programmable and custom-tailored illumination patterns (circles/segments)

  →Radiant exposure gradients

www.avedro.com

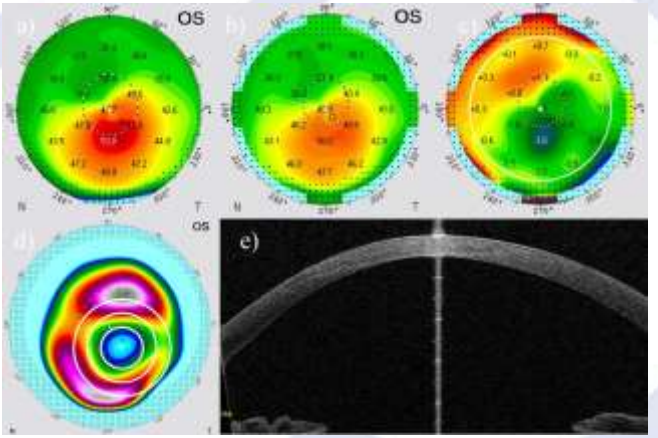
results

Customized vs. standard CXL group

	customized CXL (n=15)	standard CXL (n=16)	p-value
age ± SD [years]	28.8 ± 6.7	24.9 ± 6.6	0.07
side [OD:OS]	9:6	9:6	1.00
sex [m:f]	11:4	9:6	0.45
endothelial cell count [cells/mm^2]	2824 ± 256	2899 ± 277	0.55
K_{max} [D]	55.9 ± 7.9	55.5 ± 5.7	0.98
thinnest pachymetry [µm]	478 ± 34	453 ± 33	0.02
BSCVA [-logMAR]	0.23 ± 0.27	0.34 ± 0.33	0.27
posterior float [µm]	68 ± 40	51 ± 27	0.19

results

typical 1 year evolution after customized CXL



regularization index = 5.3D

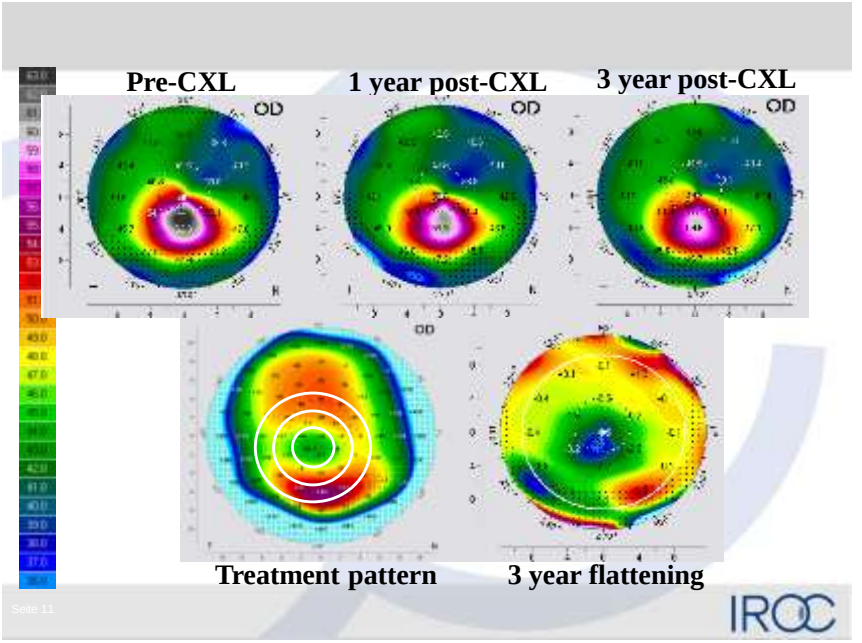
Seiler TG et al. American Journal of Ophthalmology 2016

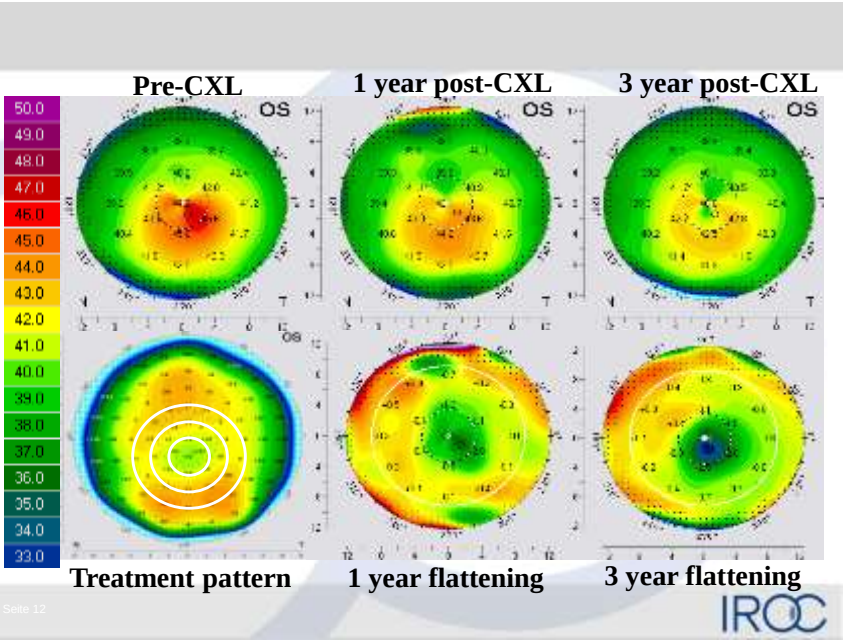
results

significant differences in 3 year course between both groups

(3 years drop-out rate 25% and 20%)

	customized CXL (n=15)	standard CXL (n=16)	p-value
epithelial healing time [days]	2.56 ± 0.50	3.19 ± 0.73	0.02
Δ K_{max} [D]	-1.9 ± 1.4	-1.1 ± 1.4	0.04
regularization index [D]	5.2 ± 1.7	4.5 ± 2.0	0.35
Δ -logMAR	-0.08 ± 0.15	-0.09 ± 0.16	0.69


Pre-CXL
1 year post-CXL
3 year post-CXL
OD
OD
OD
OD
Treatment pattern
3 year flattening


Pre-CXL
1 year post-CXL
3 year post-CXL
50.0
49.0
48.0
47.0
46.0
45.0
44.0
43.0
42.0
41.0
40.0
39.0
38.0
37.0
36.0
35.0
34.0
33.0
OS
OS
OS
OS
Treatment pattern
1 year flattening
3 year flattening

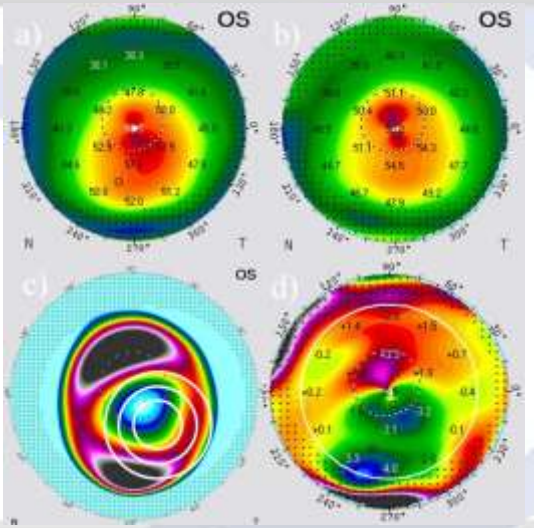
results

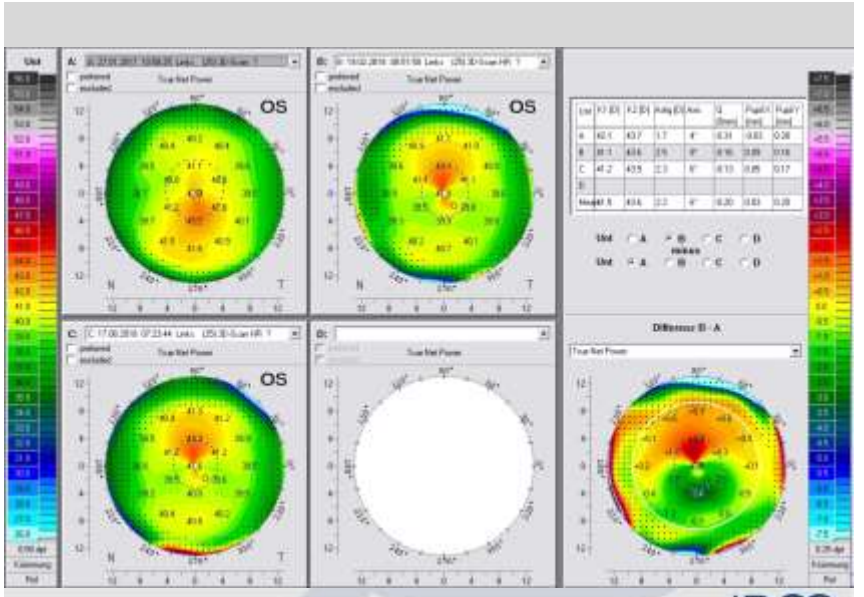
distribution of flattening in K_{max} after 1 and 3 years

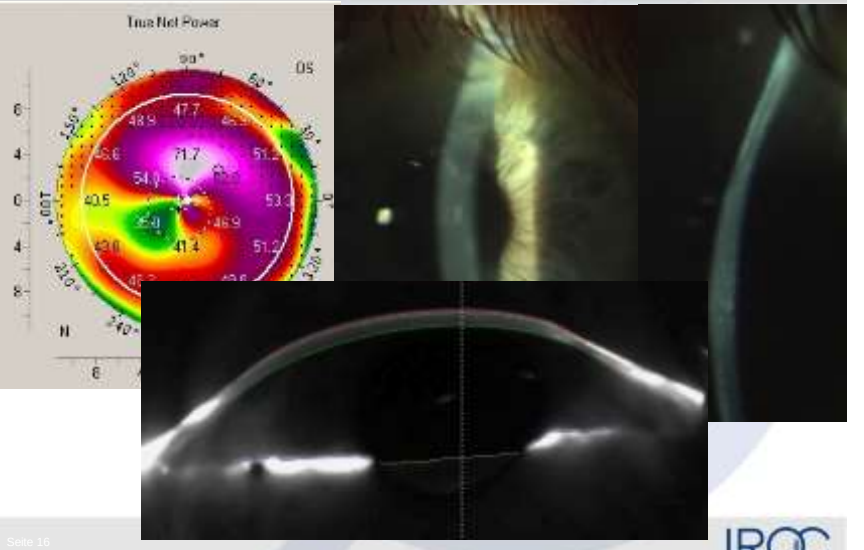
(cumulative counting, including 1 year data from drop out patients)

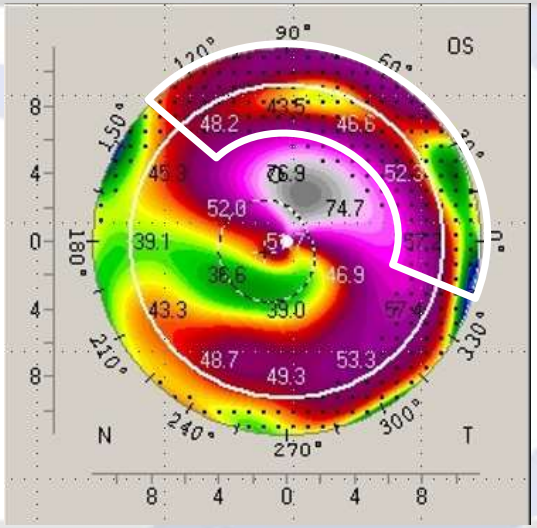
ΔK_{max}	cCXL 1a	cCXL 3a	sCXL 1a	sCXL 3a
>+1 D	0 % (0)	0 %	0% (0)	0% (0)
+1D to -1D	44% (8)	33% (6)	63% (12)	58% (11)
<-1 D	56% (10)	67% (12)	37% (7)	42% (8)
<-2 D	39% (7)	56% (10)	11% (2)	21% (4)
<-3 D	22% (4)	39% (7)	11% (2)	11% (2)

→Greater quantitative and qualitative flattening in customized CXL!




OS
OS
OS
Difference B - A


True Net Power
OS



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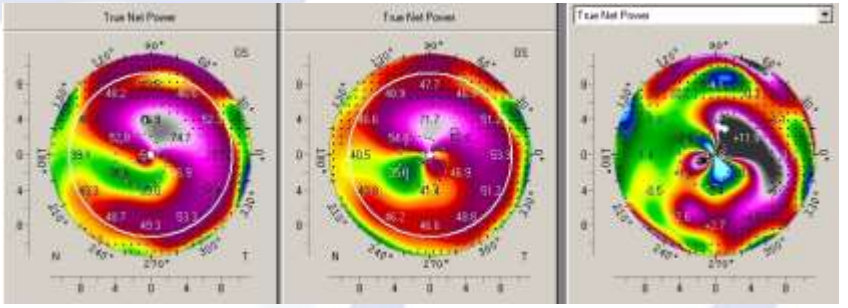
reverse melting



BSCVA 20/50 **BSCVA 20/30**

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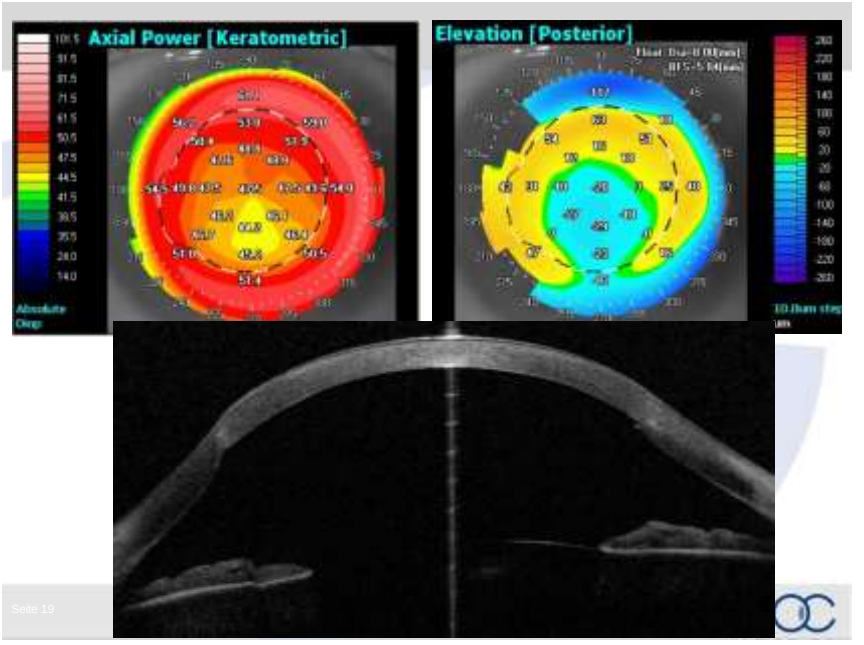

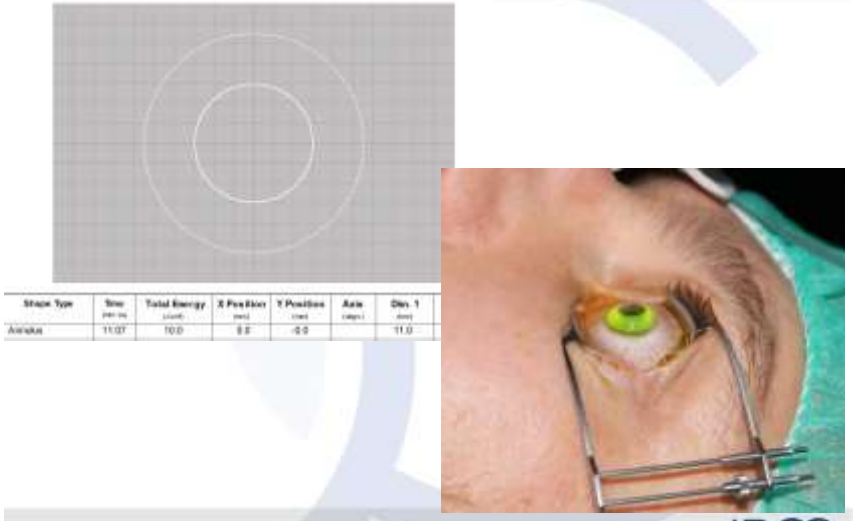

Shape Type	Time	Total Energy	X Position	Y Position	Axis	Dev. 1
Annulus	11.07	10.0	0.0	-0.0		11.0

Conclusions

1. Customized CXL appears to be more effective compared to the Dresden protocol.

2. Customized CXL is considered to be safer because of shorter re-epithelization.

3. The regularization process continues for years.

4. New patterns will be designed for special applications.