Therapeutic Applications of Scleral Contact Lenses in the Pediatric Population

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Scleral Lenses in Kids

- Scleral lenses in kids not a common practice
- Large scale studies: Age of scleral lens wearers varies 30 - 70 years
- Limited reports in the literature - Gungor, JAAPOS 2008, Rathi CLAE 2012
- Major fitting indication – OSD management (65 to 87%)
- Minority irregular cornea and refractive disorders

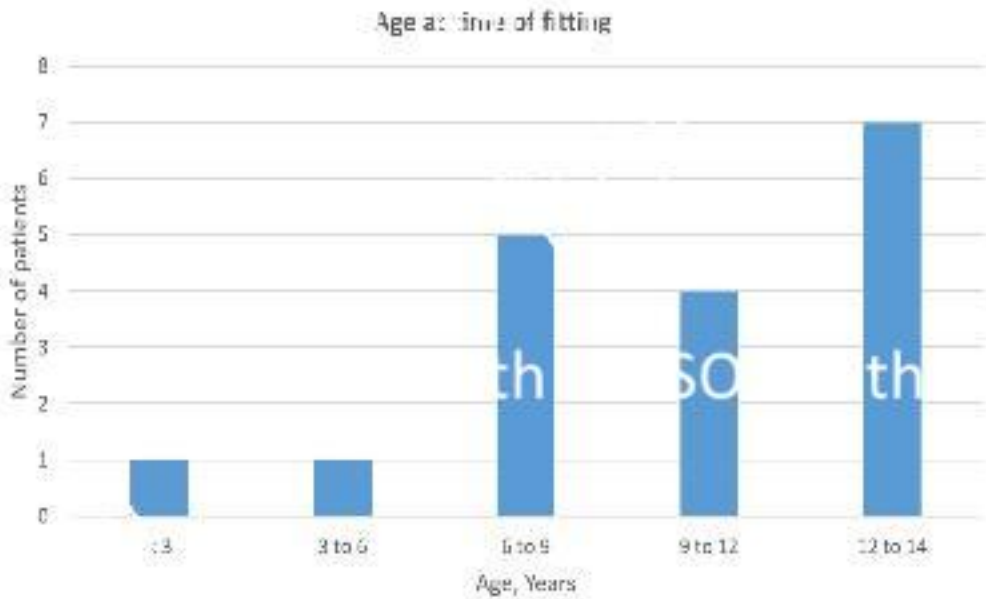
Gungor I, Schor K, Rosenthal P, et al. The Boston Scleral Lens in the treatment of pediatric patients. AAPOS. 2008
Rathi VM, et al. Fluid filled scleral contact lens in pediatric patients: challenges and outcome. Cont Lens Anterior Eye. 2012
Pullum KW, Buckley RJ. A study of 530 patients referred for rigid gas permeable scleral contact lens assessment. *Cornea*. 1997
Severinsky B, Millodot M. Current applications and efficacy of scleral contact lenses — a retrospective study. J Optom. 2010

Emory Experience with Scleral Lenses in Children

Study Population

- Retrospective chart review, March 2018 to February 2020
- 24 eyes of 18 patients under 15 yr of age
- Patient age at the fitting visit: 16 months to 14 years, mean age of 9.9±3.5 yr
- Two groups:

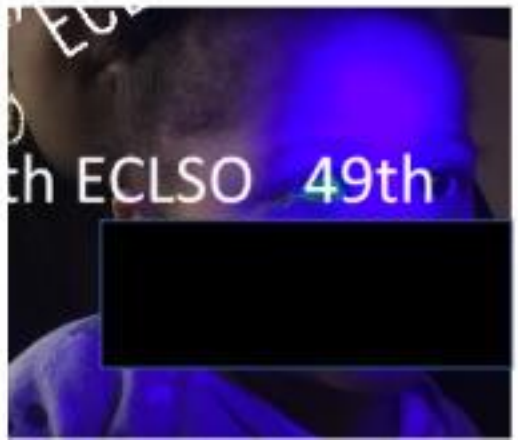
- Irregular cornea (KC and PK)
  Mean age 12.3±3.3 years
- OSD (NK, BKC, K-sicca)
  Mean age 8.2±2.2 years



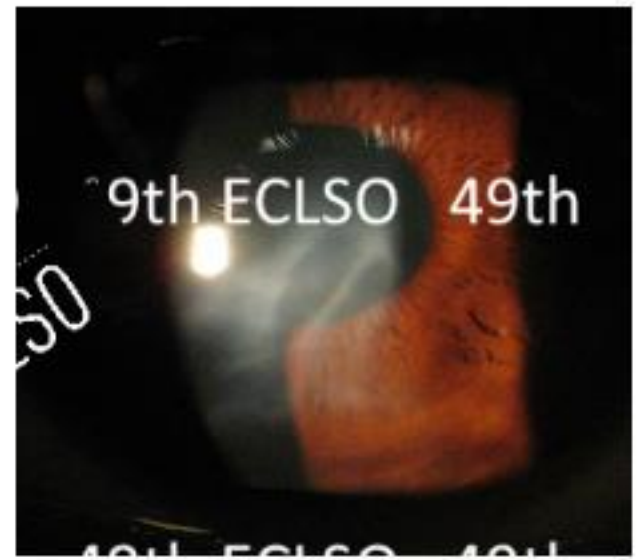
Sealed vs Fenestrated

- Fenestrated:
  - Cons: Larger diams, high complexity fitting, multiple modifications required
  - Pros: easily inserted -- don't require face down position, not fluid filled
  - Rarely used
- Sealed:
  - variety of designs allowing for diameter/landing zone size modifications
  - smaller designs could be easily handled by caretaker/kids

All lenses in our study were sealed with diameters ranging 14.6 to 16.6 mm



Pediatric Keratoconus



More common than you thought

- 0.53% to 4.8% of children below age 14 -16
- Higher prevalence in the Middle East

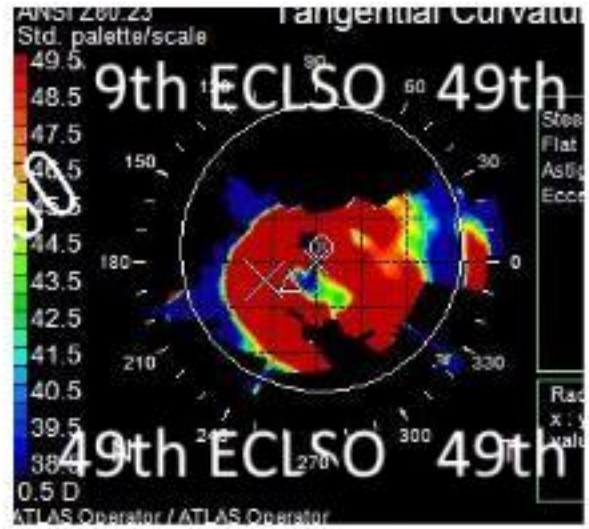
More progressing in nature

- Higher corneal elasticity in kids = decreased corneal resistance
- Higher incidence of corneal scarring → Debilitating vision/function loss
- Coexisting Allergies and Eye rubbing → Accelerate progression???

Torres Netto EA, et al. Prevalence of keratoconus in paediatric patients in Riyadh, Saudi Arabia. Br J Ophthalmol. 2018
Rabinowitz YS et al. Computer-assisted corneal topography in family members of patients with keratoconus. Arch Ophthalmol. 1990

Pediatric Keratoconus

- 12 yom
- H/o Allergies and **Eye Rubbing**
- Bad vision since age 10, glasses “never worked”
- Kmax **OD 75.0; OS 84.6!!!**
- Thin corneas **OD-350; OS-320 mic**

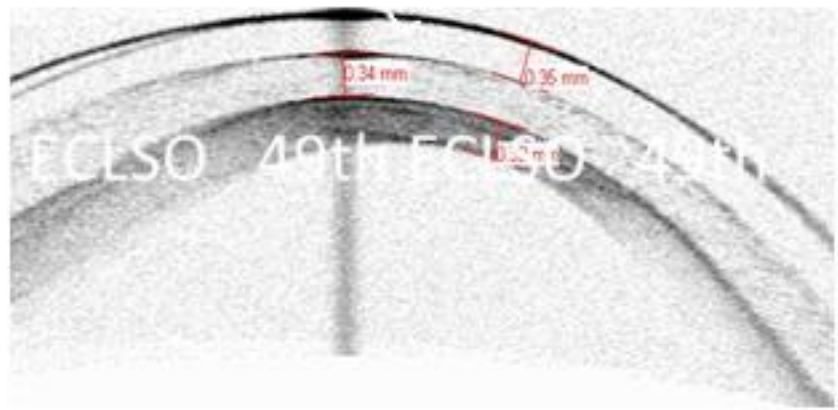


PK vs Scleral lenses?

-Doing well with Sclerals

-BCVA OD 20/25; OS 20/30

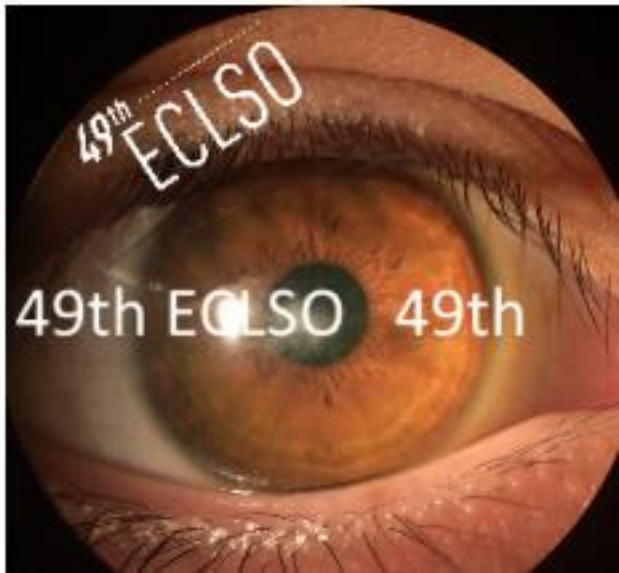
-Scheduled for CL assisted CXL OD



Our study - Pediatric Keratoconus

- Mean age 12.3±3.3 yr. 12 eyes (52%)
- Mean Kmax of 64.0±12.6, corneal astigmatism 7.2±4.2 D
- Severe forms of the disease → failure with corneal GP's
- In 6 eyes with advanced KCN (Kmax 71.8±11.0 D) **SL obviated the need for PK**

- Six out of 12 eyes underwent corneal crosslinking (CXL)
- Contact lens fitting 2.1±1.3 months after the procedure
- 20/40 or better in ALL fitted eyes



Mukhtar S, et al. Pediatric keratoconus: a review of the literature. Int Ophthalmol. 2018.

Pediatric PK vs CXL and/or Scleral Lenses

- High success is associated with PK in adult keratoconus
- Corneal transplantation carries poorer prognosis in children
- Increased risk of graft failure, decreased graft survival rates, the need for additional procedures and increased rate of post-surgical glaucoma
- **Both corneal crosslinking and scleral lenses have been shown to decrease the rates of penetrating keratoplasty in keratoconus**

Sandvik GF, et al. Does Corneal Collagen Cross-linking Reduce the Need for Keratoplasties in Patients With Keratoconus? Cornea. 2015.
Koppen C, et al. Scleral Lenses Reduce the Need for Corneal Transplants in Severe Keratoconus. Am J Ophthalmol. 2018.

Penetrating Ocular Injuries

- 8 yom, Corneal laceration from sharp object
- Central corneal scarring, Irregular Astigmatism
- S/p CE+IOL
- MRx 20/100
- BCVA SCL 20/25

Pediatric Ocular Surface Disease

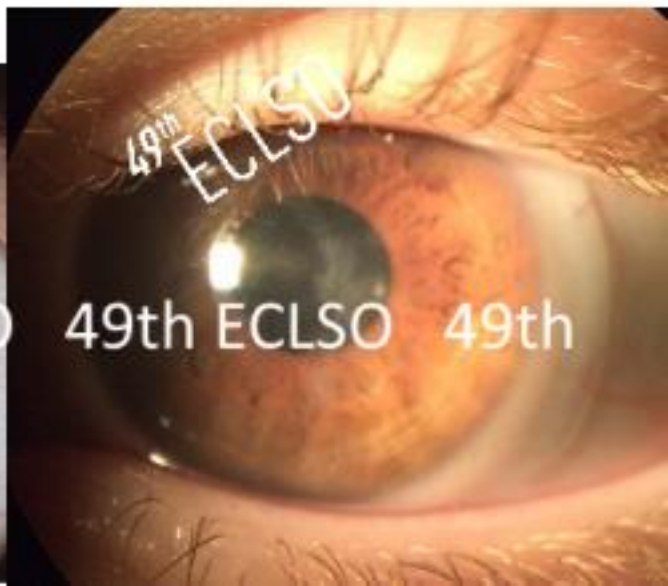
- **Support of the surface and protection from the environment**
- **Vision correction and Amblyopia management**
- GVHD, SJS, Neurotrophic and Exposure Keratitis
- Corneal scarring from HSV, BKC and etc.

- SCL - Lower risk of infection than overnight BCL

- **Our study: Patients in the OS group were significantly younger than patients fitted for irregular cornea indications (8.2±2.2 vs 12.3±3.1, years)**
- **8 patients below age 10, all with corneal scarring, 3 of them with NK**

HSV Keratitis related Dry Eye

- 6 yof, HSV Keratitis, VA 20/100
- Ant stromal scarring, Irregular Astigmatism, PEE's +2
- Valtrex 500 mg bid
- Started SCL for surface protection and vision rehabilitation
- PEE's resolved after starting SCL → VA 20/40- (doing patching OD)

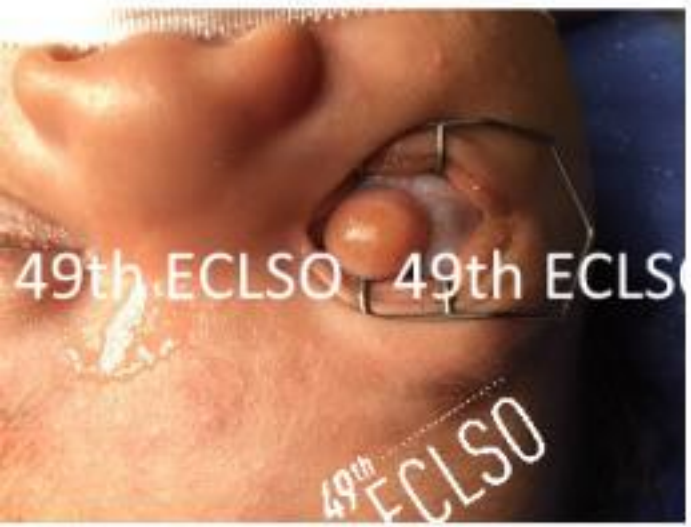


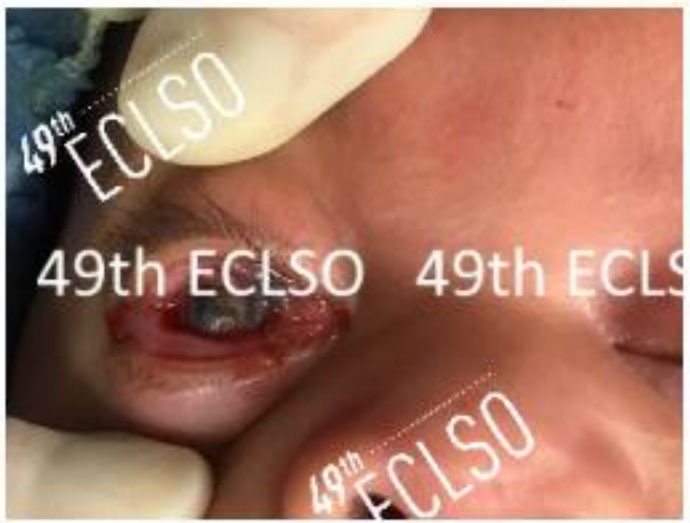
HSV Keratitis Related Scars

- **5-year-old patient!**
- Corneal scarring and irregular astigmatism from HSV keratitis age of 4 yo
- UCVA 20/70 , limited to surface and amblyopia
- No HSV recurrences with SCL
- Doing well with patching, improved to 20/30

Pediatric Keratoplasty

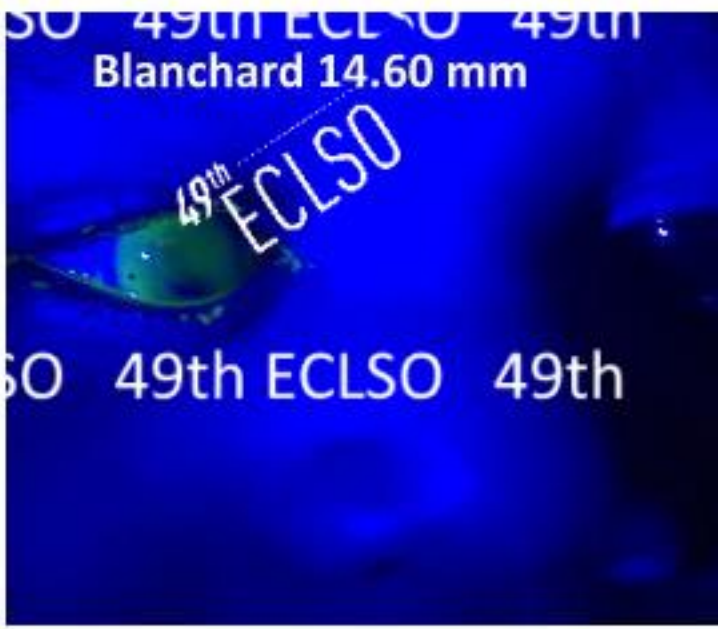
- 4 weeks old - s/p excision of corneal dermoid lesion
- 2/21/19 OD with ocular surface reconstruction with Tutoplast scleral patch graft and DALK
- DALK with central scarring, scleral patch graft inferiorly well-healed
- S/p optical PK OD 6/20/19





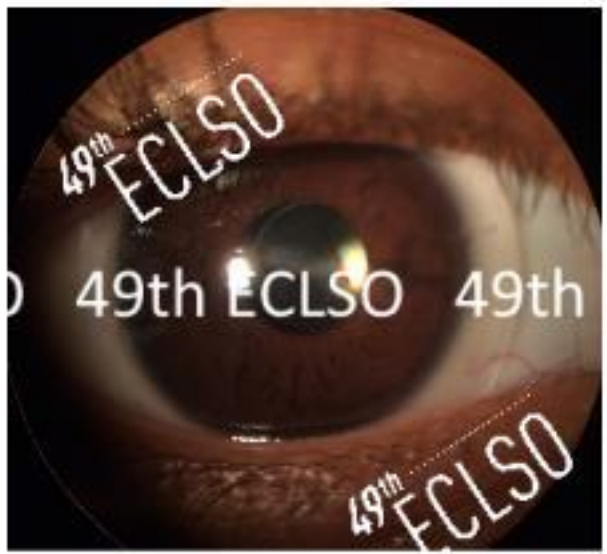
Pediatric PK and Scleral L:enses

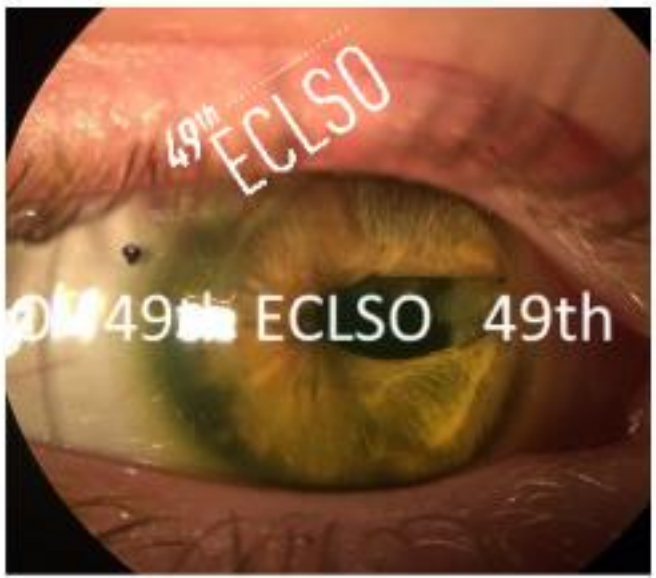
- 12.00 D of Corneal Astigmatism
- Deep Amblyopia – RET
- Scleral lens fitted 01/15/2020
- Blanchard 14.6, quadrant specific haptics, BXO2 material



Risk vs Benefit

- Two failures, related to the patient's (caretaker) inability to handle SL insertion and one to corneal graft rejection episode.
- Youngest patient (16 m old, post PK) - corneal graft rejection, SCL wear related??
- In four eyes with advanced KC (mean Kmax 74.6±8.5 D) and three eyes with traumatic corneal perforation SL use obviated the need for keratoplasty





Conclusions

- Pediatric patients with advanced keratoconus are most appreciative of the benefits of scleral lenses.
- SCL serves as an alternative to surgery and provide successful vision rehab
- Therapeutic benefits of SL:
  - facilitate healing, and protect the ocular surface
  - improve vision and prevent Amblyopia
- Ophthalmologists should be aware of innovations in contact lenses to fully inform patients of options for the treatment of disease

Pt #	Age, years	Gender	Indications	Surgical History	F/U time, months	Wearing time, hours	Final Lens Diameter, mm
1	1.3	F	PK	Corneal Dermoid removal, PK	1.5/Failure	9	14.9
2	5	M	NK, K scarring (HSV)		11	8	16.0
3	6	F	K scarring (HSV)		2	8	15.2
4	7	M	K Scarring	K laceration repair	Failure		15.2
5	8	M	K Scarring	Pseudophakia, K laceration repair	9	7	16.0
6	8	M	NK, K scarring	Hemifacial Microsomia, lagophthalmos repair, Electrolysis	5	9	16.2
7	8	F	NK, K scarring	Clear Cell Meningeoma removal	2	8	16.0
8	9	M	BKC	Recurrent chalazion excision	Failure		15.4
9	11	F	BKC, K scarring	Recurrent chalazion excision	12	8	15.4
10	11	M	K scarring	K laceration repair	10	10	16.0
11	11	M	Aphakia	Lensectomy	3	10	14.9
12	12	M	BKC, K scarring	Recurrent chalazion excision	12	7	15.4
13	13	M	KCN	CXL	6	10	16.6
14	13	M	KCN	CXL	2	10	16.6
15	13	F	KCN	CXL	1	9	16.0
16	13	M	KCN		22	10	16.0
17	14	M	KCN		21	12	16.4
18	14	M	KCN	CXL	12.5	10	16.6