



**Comparison of Clinical Performance, Midday
Fogging and Lens Settling of Two Mini-
Scleral Lenses in Patients with Keratoconus**

Elif BAGATUR VURGUN^a, Semra AKKAYA TURHAN^a, Ayşe Ebru TOKER^b

a. Marmara University Medical Faculty Ophthalmology Department Istanbul

**b. Department of Ophthalmology and Visual Sciences, West Virginia University Eye Institute,
Morgantown, West Virginia, USA**



Disclosure Statement of Financial Interest

The authors have no financial interest in the subject matter of this presentation.



INTRODUCTION



49th ECLSO 49th ECLSO 49th ECLSO 49th ECLSO 49th ECLSO 49th










INTRODUCTION



Scleral Contact Lens Indications

-  Corneal irregularity
-  Corneal surface protection
-  After refractive surgery
-  Sports & cosmetics
-  Drug administration



INTRODUCTION



Classification of Scleral Contact Lenses by Size and Fitting Properties



Rests entirely on cornea

Corneal



Rests both on cornea and sclera

Corneo-Scleral



Rests entirely on sclera

Scleral

Mini-Scleral
Lens larger than HVID* ≤ 6 mm
Large Scleral
Lens larger than HVID* > 6 mm

*HVID: Horizontal Visible Iris Diameter

**Fadel D. Modern scleral lenses: Mini vs large. Cont Lens Anterior Eye. 2017;40:200-207.



INTRODUCTION

Two important factors affecting clinical performance of scleral lenses :

*Settling**

- Decreased sagittal height of the tear reservoir as the haptic or periphery of the scleral lens “settles” and compresses the bulbar conjunctiva and lens (1) capsule

*Midday Fogging***

- One of the most common ScCL complications
- A fog-like cloudiness with the accumulation of particulate matter in the tear reservoir between the contact lens and the cornea

20-40%***

*M.J. Kauffman, et al., A comparison of the short-term settling of three scleral lens designs, *Optom Vis Sci*, 91 (12) (2014) 1462–1466.

**Walker M, Bergmanson JP, Varsak JL, Miller W, Johnson L. Complications and Fitting Challenges Associated with Scleral Contact Lenses: A Review. *Contact Lens Anterior Eye*. 2016;39(2):88–96.

***Fogt JS. Midday Fogging on Scleral Contact Lenses: Current Perspectives. *Clin Optom (Auckl)*. 2021, 13:209-219.



PURPOSE



To compare post-lens fluid optical density changes, timing and quantity of settling and clinical performance of two mini-scleral contact lenses.



METHODS



17 eyes of 11 patients with keratoconus were fitted with 15 mm mini scleral lenses (Mini Scleral Lens Contact Lens, Vision Care, Germany, 1 year).

15 eyes of 9 patients with keratoconus were fitted with 16.5 mm mini scleral lenses (Mini Scleral Lens Contact Lens, Vision Care, Germany, 1 year).

At 0, 2, and 4th hours
Corneal optical clearance and swelling amount measurements by AS-OCT

Optical density measurements by Scheimpflug tomography

At the end of 4th hour;
Patients' comfort and visual quality with a 5-point Likert scale
Overall satisfaction assessment with 100 mm-VAS scale

Lens fitting
Pre-lensase (0.01 mm) and lens fitting
Anterior segment optic coherence tomography (AS-OCT)

High and Low Contrast Visual Acuity
Snellen chart
Pelli-Robson contrast sensitivity chart





METHODS



17 eyes of 11 patients with keratoconus were fitted with a 15 mm mini scleral lens (AirKone Skleral Lens; Industrie Linsen Mannheim, France)

15 eyes of 9 patients with keratoconus were fitted with 16.5 mm mini scleral lenses (Misa Lens; MCT, Arnhem, Netherlands)



	AirKone Scleral Lens	Misa Lens
Material	Acuity 200 (fluoroxycocoon A)	Fluorosilikon akrilat
Thickness	0.20 mm	0.30 mm
Dk	200	120
Diameter	15 mm	16.5 mm
Lining zone	1.5 mm	1.25 mm

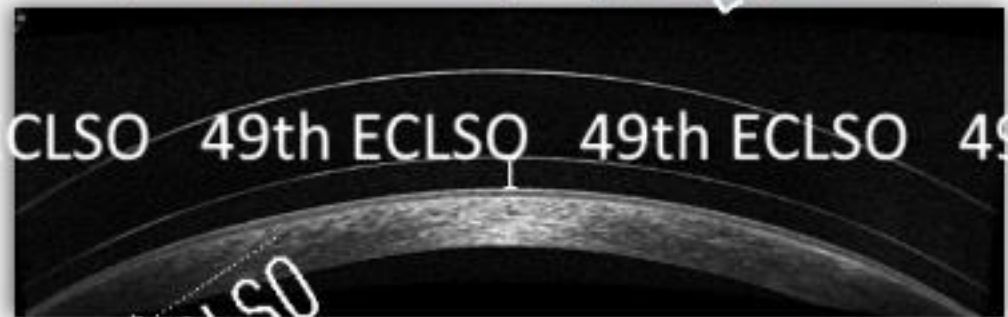


METHODS



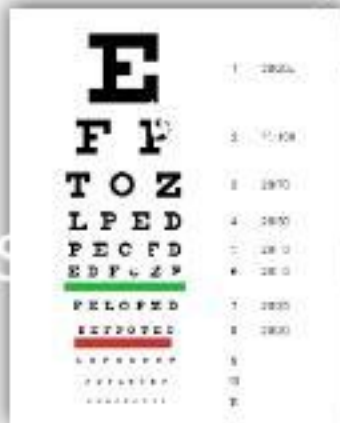
Lens fitting

- Biomicroscopy/fluorescein pattern
- Anterior segment optic coherens tomography (AS-OCT)





METHODS



High and Low Contrast Visual Acuity

- Snellen chart
- Pelli-Robson contrast sensitivity chart



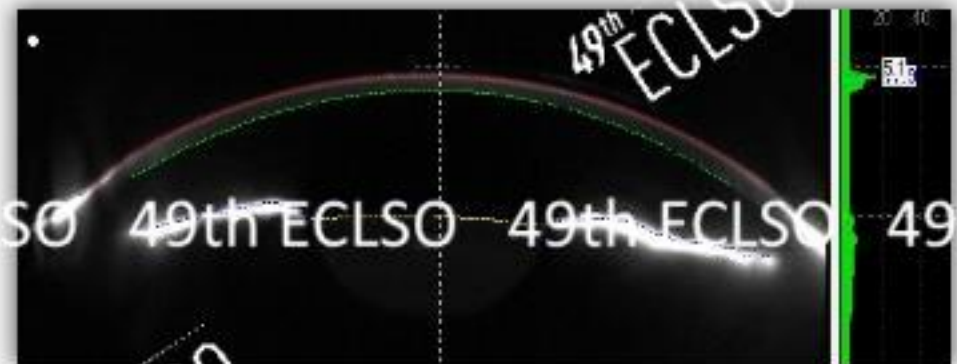
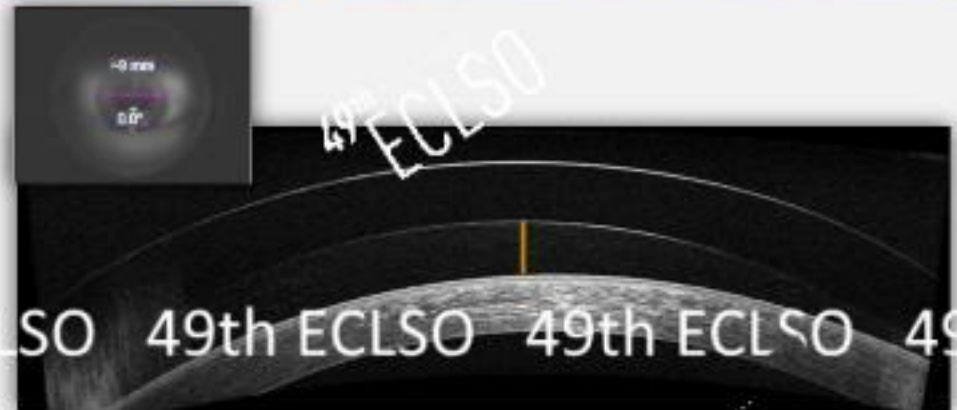


METHODS



At 0,2 and 4th hours

- Corneal apical clearance and settling amount measurements by AS-OCT (Cirrus HD-OCT; Carl Zeiss Jena, Jena, Germany)
- Optical density measurements by Scheimpflug tomography*
 - Midpoint between the edges of the central cornea-pupil
 - The indicator is placed between the posterior surface of the lens and the anterior surface of the cornea
 - Average optical density is calculated automatically





METHODS



At the end of 4th hour;

patients' comfort and visual quality with a 5-point Likert scale

- Overall satisfaction assessment with 100 mm-VAS scale





RESULTS



Patients' Demographics

Sex

Male

3

5

Female

3

4

Age

Mean \pm SD

24.4 \pm 5.4

21.7 \pm 4.5

(Range)

(16-32)

(18-29)

Mean Kmean

47.67

45.98

Mean Kmax

56.66

54.36

AirKone Scleral Lens Group

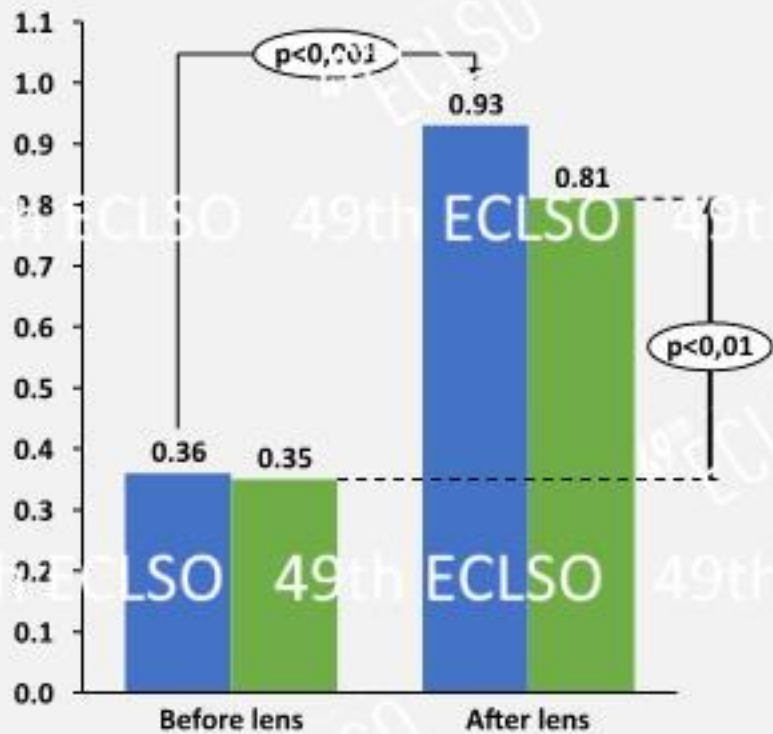
Misa Lens Group



RESULTS

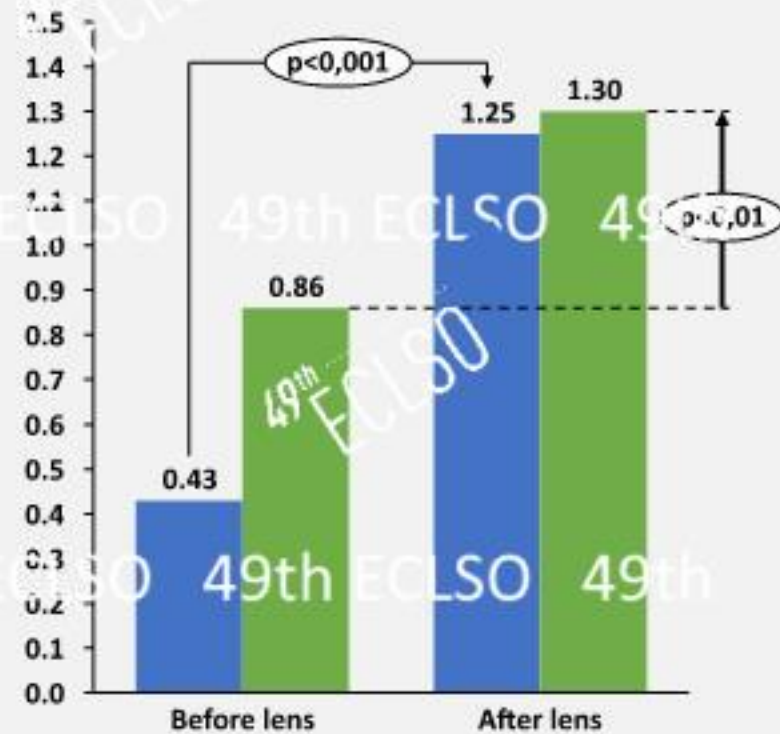


High Contrast Visual Acuity



In both groups a significant increase was observed in both high and low contrast visual acuities of the patients after ScCL fitting.

Low Contrast Visual Acuity



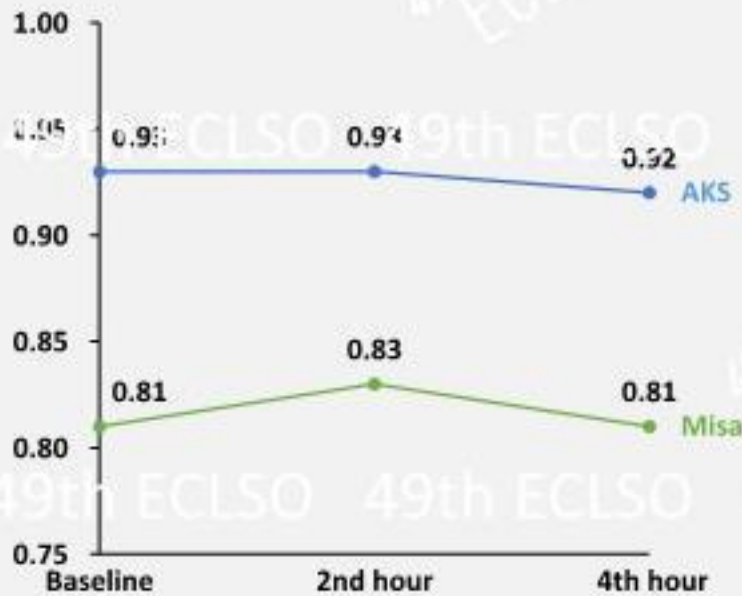
AKS
Mira



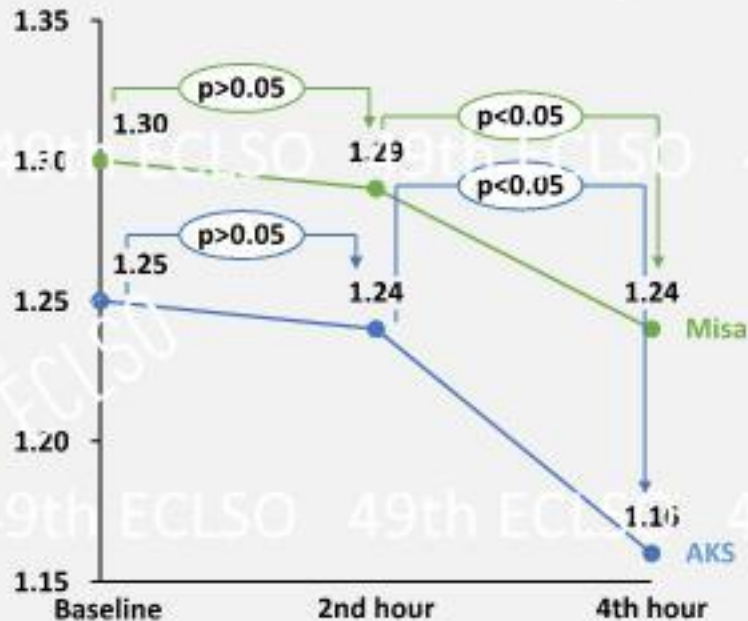
RESULTS



High Contrast Visual Acuity Change



Low Contrast Visual Acuity Change



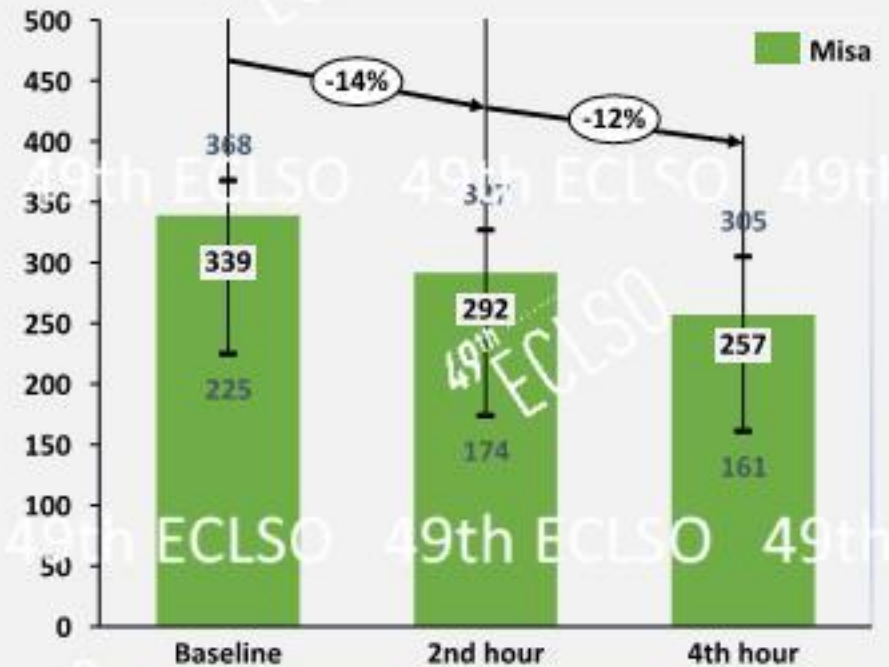
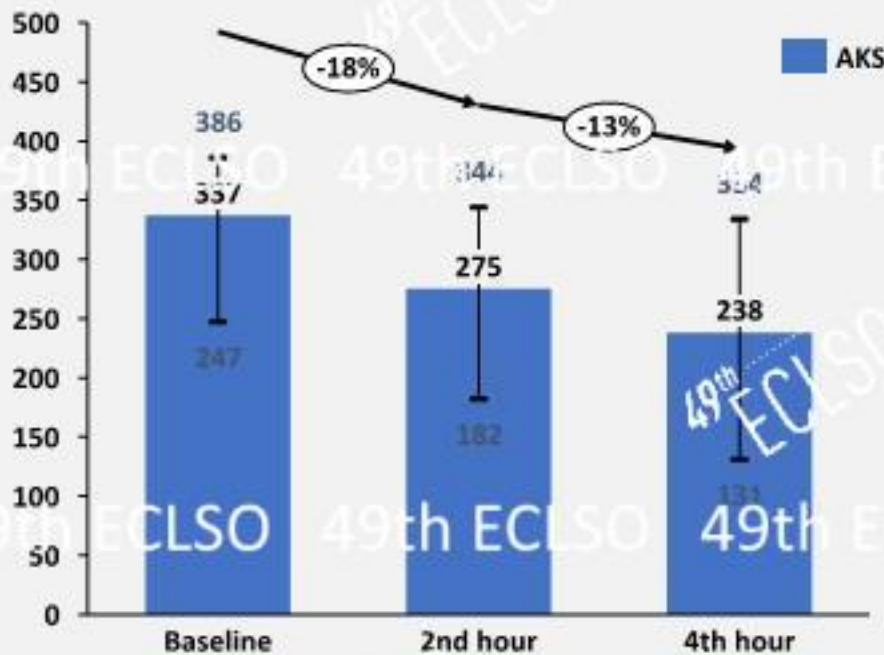
- High-contrast visual acuity remained stable in both groups.
- There was a significant decrease in low-contrast visual acuity in both groups after 2 hours.
- There was no significant difference in low and high contrast visual acuities between the two groups at any visit.



RESULTS



Central Corneal Clearance Change (μm)

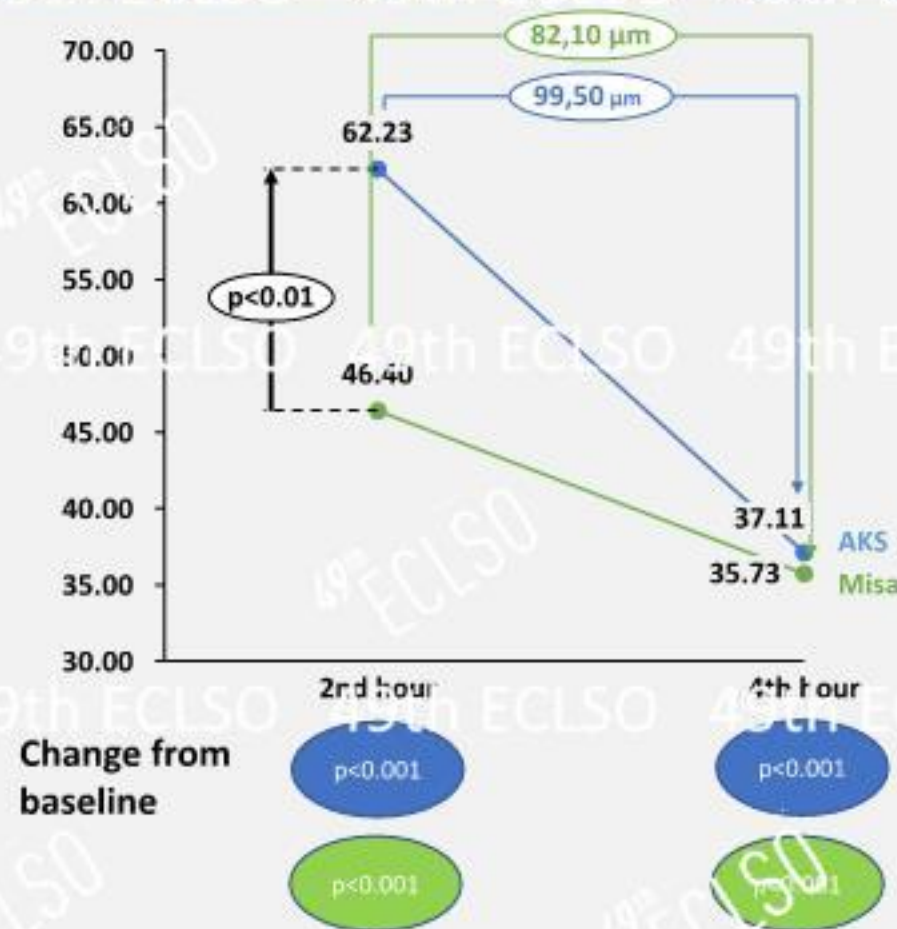




RESULTS



Settling Amount (μm)



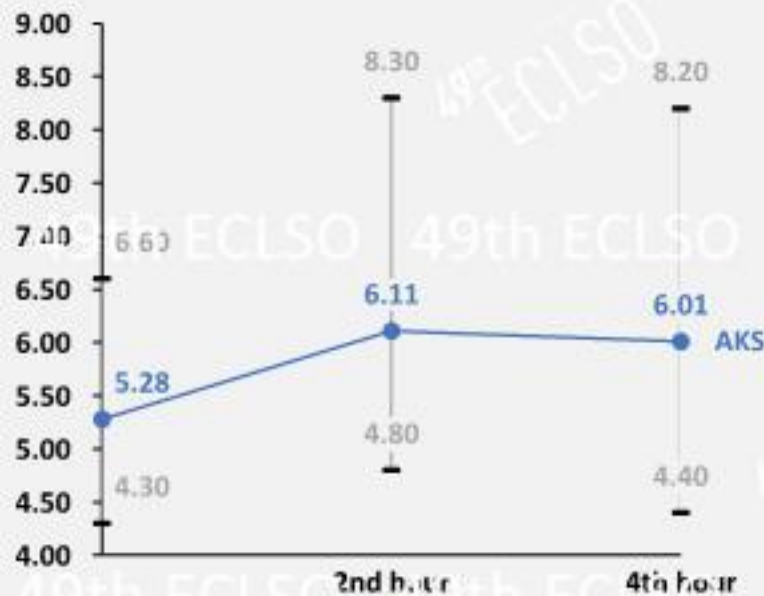
- Significant decrease was observed in both groups at 2nd and 4th hours compared to baseline.
- **At the 2nd hour, more settling was observed in the AKS group.**
- At the end of the 4th hour, the amount of settling was 99.5 μm in the AKS group and 82.1 μm in the Misa group, which were similar.



RESULTS

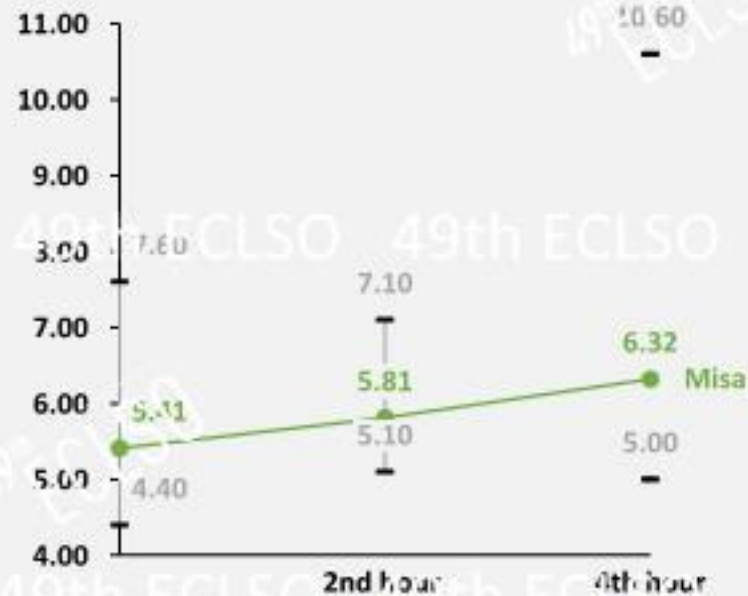


Optical Density (%) Changes



2nd hour

4th hour



2nd hour

4th hour

Change from baseline

$p < 0.05$

$p < 0.05$

$p < 0.05$

$p < 0.05$

• A significant increase was observed in the mean optical density in both groups compared to the baseline.
The mean densities of the two groups were found to be similar at 0, 2 and 4 hours.



RESULTS



Subjective Performance	AKS	Misa
Comfort (5-point Likert)	4.6 ± 0.7	3.6 ± 0.9
Visual Quality (5-point Likert)	4.8 ± 0.6	3.7 ± 0.7
Overall Satisfaction (100-mm VAS)	95.7 ± 6.0	65.3 ± 20.3

p < 0.001





DISCUSSION



CLINICAL SCIENCE

Mini-Scleral Lenses Improve Vision-Related Quality of Life in Keratoconus

Kreps, Elke O. MD^{1,2,3}; Pesudovs, Konrad PhD⁵; Claerhout, Ilse MD, PhD^{1,2}; Koppen, Carina MD, PhD^{1,2}

Cornea; July 2021 - Volume 40 - Issue 7 - p 859-864

- 89 eyes of 50 keratoconus patients
- Mini-Misa lens, Senso mini-scleral lens or Zenlens mini-scleral lens
- Assessment with VA and NEI VFQ-39
- 6-month follow-up; 39 patients continue to use
- *Mini-scleral lenses significantly improve visual acuity and visual function in patients with keratoconus.*



DISCUSSION



Eye & Contact Lens: Science & Clinical Practice: November 2020 - Volume 46 - Issue 6 - p 353-358

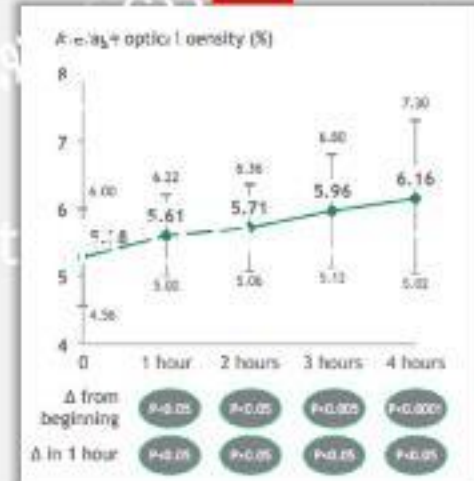
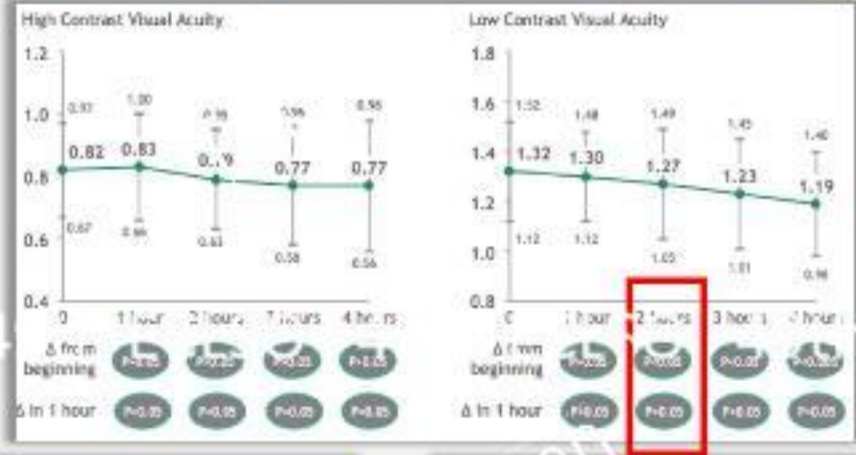
Impact of Changes in the Optical Density of Postlens Fluid on the Clinical Performance of Miniscleral Lenses

Akkaya Turhan, Semra M.D.; Dizdar Yigit, Didem M.D.; Toker, Ebru M.D.

- 23 eyes of 13 keratoconus patients
- 16.5 mm mini-scleral lens (Misa lens)
- Optical density measurement by Scheimpflug tomography at 30th min, 1st, 2nd, 3rd and 4th hours.

Similarly, in the Misa group in our study;

- Optical density increased over time (5.41 → 5.81 → 6.22)
- High-contrast VA was stable
- Low contrast VA decreased after 2 hours.





DISCUSSION



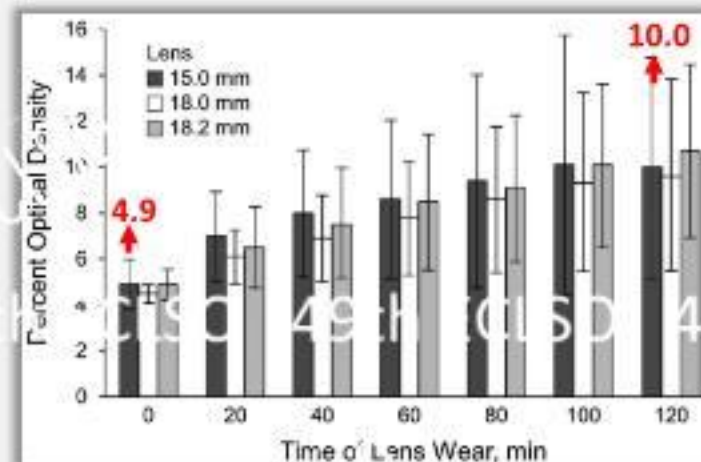
Eye & Contact Lens: Science & Clinical Practice: November 2018 - Volume 44 - Issue - p S344-S349

Changes in Optical Density of Postlens Fluid Reservoir During 2 Hours of Scleral Lens Wear

Schornack, Muriel M. O.D.; Nau, Cherie B. O.D.



- 35 healthy participants
- 15 mm Jupiter, 18 mm Digiform and 18.2 mm Jupiter scleral lenses
- Optical density measurement by Scheimpflug tomography every 20 mins for 2 hours
- Optical density increase of 105% for the 15mm lens, 117% for the 18 and 18.2mm lens at the end of the 2nd hour.



There was also a significant increase in optical density over time in the 15mm lens group in our study; but at the end of the 2nd hour **15 %**



DISCUSSION



Eye & Contact Lens: Science & Clinical Practice: July 2017 - Volume 43 - Issue 4 - p 230-235

Influence of Apical Clearance on Mini-Scleral Lens Settling, Clinical Performance, and Corneal Thickness Changes

Esen, Fehim M.D.; Toker, Ebru M.D.

- 22 eyes of 11 keratoconus patients
- 16.5 ve 17.5 mm mini-scleral lens
- Corneal apical clearance measurement with OCT at 15th min, 1st, 2nd, 4th, 6th, 8th hours
- At the end of 8th hour, settling amount $62.8 \pm 38.4 \mu\text{m}$
- *80% of total settling ($50.7 \pm 31.6 \mu\text{m}$) at 4 hours*
- *Settling occurred more in small diameter lens ($p=0.03$)*

Scleral lens settling over time

	1h	2h	4h	6h	8h
Settling (μm)	26.8 \pm 18.8	38.5 \pm 25.5	50.7 \pm 31.6	57.4 \pm 24.6	62.8 \pm 38.4
Percentage	42.1%	62.0%	80.0%	91.4%	100%

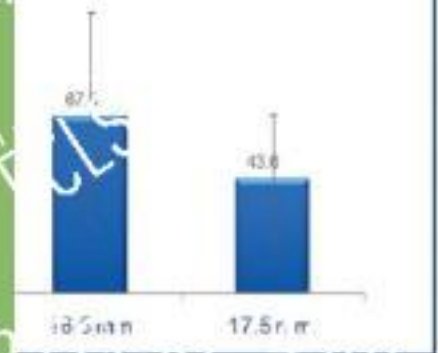
Setting and lens diameter

	16.5 mm (n=44)	17.5 mm (n=11)	p
Settling (μm)	87.6 \pm 39.8	43.6 \pm 25.1	0.03

In our study, in the 8th hour

The amount of settling of the 15mm lens is 99.5 μm
The amount of settling of the 16.5mm lens is 82.1 μm

Similarly, the amount of settling in the small diameter lens was higher, but it did not reach a statistically significant level.





CONCLUSION



In this study;

The amount of settling was found to be similar in both mini-scleral lenses after 4 hours of follow-up.

It has been shown that the optical density of the postlens fluid both mini-scleral lenses increases over time and this increase may result in a decrease in low-contrast visual acuity.

Comfort, visual quality and overall satisfaction were scored higher in the 15mm mini-scleral lens group. *This difference may be due to the difference in diameter, thickness and Dk between the two lenses.*



49th ECLSO 49th ECLSO 49th ECLSO 49th ECLSO 49th ECLSO 49th

THANK YOU

49th ECLSO 49th ECLSO 49th ECLSO 49th ECLSO 49th ECLSO 49th