Gelecekte GİL?

Prof. Dr. İzzet Can
Bozok Üniversitesi Tıp Fakültesi
Yozgat

Nasıl Bir GİL / Tartışma

- Materyal
- Küçük kesi GİL
- Kromatik aberasyon
- Sferik aberasyon düzeltme
- Kısa dalga boylu ışık filtrelemesi
- Presbiyopi düzeltme
- Piggyback yaklaşım

Materyal

- PMMA
  - Çok iyi santralizasyon
  - Çok iyi uveal biyouyumluluk
  - Katlanamaz
- Silikon
  - Katlanabilen ilk lens
  - Gözde inflamatuar etkileri daha fazla
  - AKK ve ÖKK daha fazla?
  - Silikon yağına kimyasal bağlanma
  - Asteroid hyalozis'li hastalarda kalsifikasyon
  - Daha az psödofakik disfotopsi (düşük kırma indeksi)
- Hidrofobik Akrilik
  - En yaygın kullanılan GİL
  - AKK'e özellikle keskin kenarlı tasarımlarda çok dirençli
  - Yüzeyi frajil
  - Bazılarında glistening problemi
  - Psödofakik disfotopsi (yüksek kırma indeksi)
- Hidrofilik Akrilik
  - Silikon yağına en dirençli
  - Biyouyumluluğu en fazla olan lenstir. (kronik uveit'te en iyi)
  - Keskin kenar AKK oranının düşürmektedir. Ama çok keskin üretilememektedir.
  - Hala AKK en önemli problemi kabul edilmektedir.
  - Kalsifikasyon sorunu?

Küçük Kesi

- **Daha hızlı iyileşme**
  - **Can İ,** Takmaz T, Yıldız Y, Bayhan HA, Soyugelen G, Bostancı B. Coaxial, microcoaxial, and biaxial microincision cataract surgery: prospective comparative study. **J Cataract Refract Surg** 2010 May; 36(5):740-746
- **Daha az kesi yeri kapanma problemi**
  - **Can İ,** Bayhan HA, Çelik H, Bostancı Ceran B. Evaluation and comparison of main clear corneal incisions in microcoaxial and biaxial cataract surgeries by using optical coherence tomography. J Cataract Refract **Surg J Cataract Refract Surg.** 2011 Mar; 37(11):490-500.
- **Daha az inflamasyon**
  - **Alio J,** Rodriguez-Prats JL, Galal A. Advances in microincision cataract surgery intraocular lenses. **Curr Opin Ophthalmol 2006**; 17:80-93.
- **Daha az endoftalmi riski**
  - **Chee S-P**, Bacsal K. Endophthalmitis after microincision cataract surgery. **J Cataract Refract Surg** 2005; 31:1834–5.
- **Daha az peroperatif komplikasyon ve ekspulsif hemoraji riski**
  - **Alio JL**. What does MICS require? In: Alio JL, Rodriguez Prats JL, Galal A, eds. MICS Micro-incision Cataract Surgery.Miami: Highlights of Ophthalmology; **2004**: 1- 4.
- **Korneanın prolate şeklinin ve biyomekaniğinin daha iyi korunması (daha iyi görme kalitesi)**
  - **Elkady B**, Alio´ J, Ortiz D, Montalba´n R. Corneal aberrations aftermicroincision cataract surgery. **J Cataract Refract Surg 2008**; 34:40-5.
- **Daha az cerrahi nedenli astigmatizma**
  - **Can İ,** Takmaz T, Bayhan HA, Bostancı Ceran B. Aspheric microincision intraocular lens implantation with biaxial microincision cataract surgery: efficacy and reliability. **J Cataract Refract Surg. 2010** Nov;36(11):1905-11.
- **Daha az cerrahi nedenli yüksek sıralı aberasyon**
  - **Can İ**, Bayhan HA, Çelik H, Bostancı Ceran B. Comparison of corneal aberrations after biaxial micro-incision and micro-coaxial cataract surgeries: A prospective study. **Curr Eye Res. 2011**; DOI: 10.3109/02713683.2011.622851

Cerrahi Nedenli Astigmatizma

Yayın	Kesi (mm)	CNA (D.)
Alio J, et al. Ophthalmology 2005; 112:1997-2003.	1.7	0.36
Kurz S, et al. Ophthalmology 2006; 113:1818-26.	1.5-1.7	0.15
Hayashi K, et al. J Cataract Refract Surg 2009;35:233–239.	2.19 2.84	0.56 0.74
Wilczynski M, et al, J Cataract Refract Surg 2009; 35:1563-9.	1.7	0.23
Can İ, et al. J Cataract Refract Surg 2010; 36: 740-6.	2.83 ± 0.11 2.26 ± 0.07 1.89 ± 0.21	0.46 0.24 0.13
Can İ, et al. J Cataract Refract Surg. 2010 ;36: 1905-11.	1.82 ± 0.09	0.20 ±0.22

Cerrahi Nedenli Yüksek Sıralı Aberasyonlar

ARTICLE

Aspheric microincision intraocular lens implantation with biaxial microincision cataract surgery: Efficacy and reliability

İzzet Can, MD, Tamer Takmaz, MD, Hasan Ali Bayhan, MD, Başak Bostancı Ceran, MD

J Cataract Refract Surg. 2010 Nov;36(11):1905-11.

Olgu sayısı: 100 göz (Akreos MI-60)
Kesi Genişliği: ~ 1.82 mm

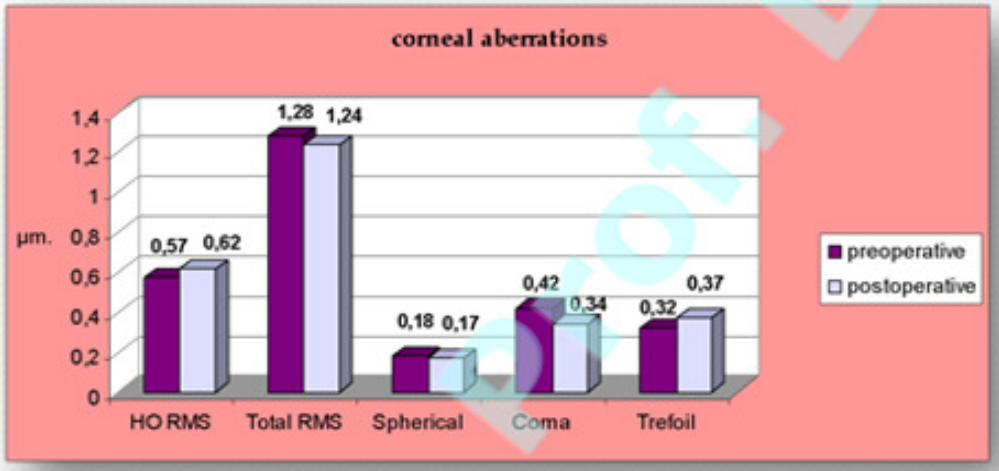

Table 4. Preoperative and postoperative corneal aberrations and postoperative ocular aberrations.

Aberration	Mean (µm) ± SD: Preoperative	Postoperative (3 Mo)	*P* Value*
Corneal			
HO RMS	0.57 ± 0.24	0.62 ± 0.26	.658
Total RMS	1.28 ± 0.67	1.24 ± 0.44	.764
Spherical	0.18 ± 0.17	0.17 ± 0.15	.925
Coma	0.42 ± 0.23	0.34 ± 0.26	.525
Trefoil	0.32 ± 0.15	0.37 ± 0.18	.625
Ocular			
HO RMS	—	0.38 ± 0.16	—
Spherical	—	0.15 ± 0.20	—
Coma	—	0.18 ± 0.14	—
Trefoil	—	0.14 ± 0.08	—

HO RMS = higher-order root mean square; RMS = root mean square
*Comparison between preoperative and postoperative (paired-samples *t* test)

Cerrahi Nedenli Yüksek Sıralı Aberasyonlar

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DOI: 10.3109/02713683.2011.622851

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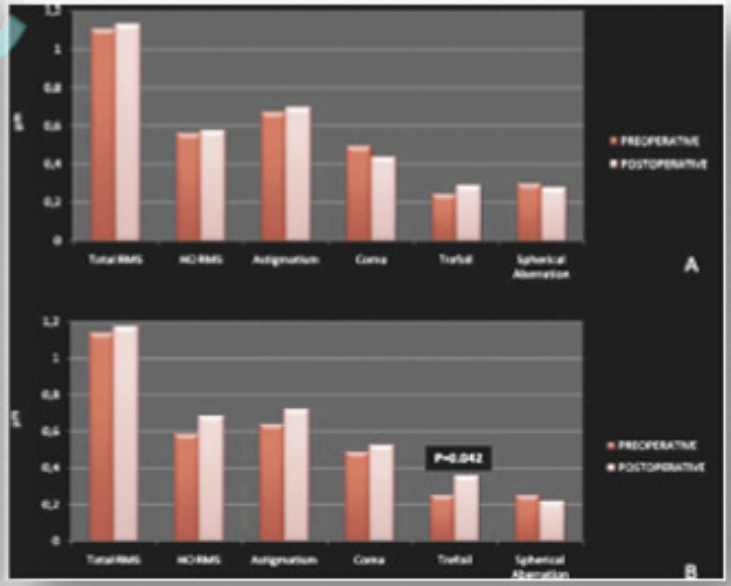
ORIGINAL ARTICLE

Comparison of Corneal Aberrations After Biaxial Microincision and Microcoaxial Cataract Surgeries: A Prospective Study

İzzet Can[1], Hasan Ali Bayhan[2], Hale Çelik[2], and Başak Bostancı Ceran[2]

[1]Director of Eye Department, Bozok University Faculty of Medicine, Yozgat, Turkey, and
[2]Atatürk Training and Research Hospital, 2nd Ophthalmology Department, Ankara, Turkey

Curr Eye Res. 2011; DOI:10.3109/02713683.2011.622851



Olgu sayısı:
40 göz B-MICS,
40 göz C-MICS

Kesi Genişliği:
1.80 ± 0.09 mm
1.89 ± 0.11 mm

Biaxial				Microcoaxial			
Zernike Terms	Preop.	Postop.	P*	Zernike Terms	Preop.	Postop.	P*
Z(2,-2)	-0.195±0.475	-0.245±0.508	0.676	Z(2,-2)	0.051±0.348	0.040±0.468	0.902
Z(2,2)	0.061±0.524	0.139±0.546	0.530	Z(2,2)	-0.129±0.714	-0.265±0.610	0.101
Z(3,-1)	0.176±0.303	0.044±0.350	0.217	Z(3,-1)	0.098±0.363	-0.121±0.344	0.002
Z(3,1)	0.092±0.416	0.005±0.333	0.062	Z(3,1)	-0.050±0.423	0.023±0.448	0.324
Z(3,-3)	-0.151±0.081	-0.196±0.193	0.423	Z(3,-3)	-0.097±0.156	-0.269±0.190	<0.001
Z(3,3)	0.017±0.212	-0.015±0.066	0.585	Z(3,3)	0.027±0.214	-0.067±0.208	0.060
Z(4,-2)	-0.003±0.073	-0.003±0.089	0.998	Z(4,-2)	-0.007±0.120	-0.005±0.169	0.845
Z(4,2)	0.081±0.188	-0.038±0.130	0.177	Z(4,2)	-0.005±0.176	-0.325±0.254	0.427
Z(4,-4)	-0.003±0.196	0.002±0.198	0.921	Z(4,-4)	0.015±0.184	0.015±0.177	0.996
Z(4,4)	-0.039±0.192	-0.009±0.202	0.385	Z(4,4)	0.002±0.153	0.020±0.218	0.644

	Biaxial	Microcoaxial	P*
SI Spherical Aberration	0.006±0.161	-0.031±0.211	0.502
SI Astigmatism	0.23±0.32 (**25**% of them ±20° adjacent to the axis)	0.26±0.42 (**27.5**% of them ±20° adjacent to the axis)	0.874
SI Coma	0.319±0.255 (**10**% of them ±20° adjacent to the axis)	0.376±0.229 (**12.5**% of them ±20° adjacent to the axis)	0.109
SI Trefoil	0.306±0.211 (**42.5**% of them ±20° adjacent to the axis)	0.451±0.229 (**57.5**% of them ±20° adjacent to the axis)	0.047

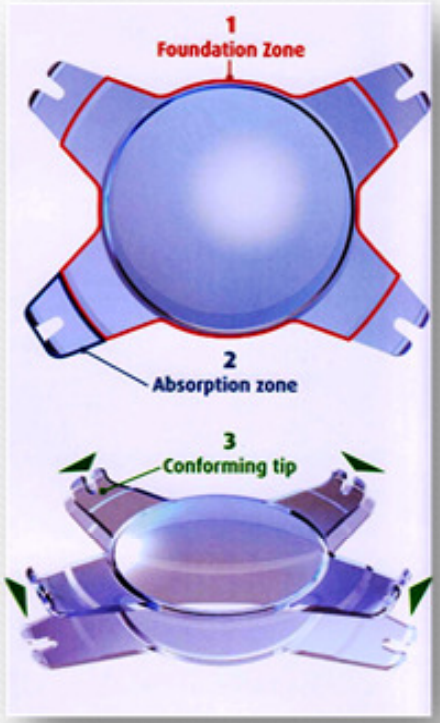
Küçük Kesili GİL'leri

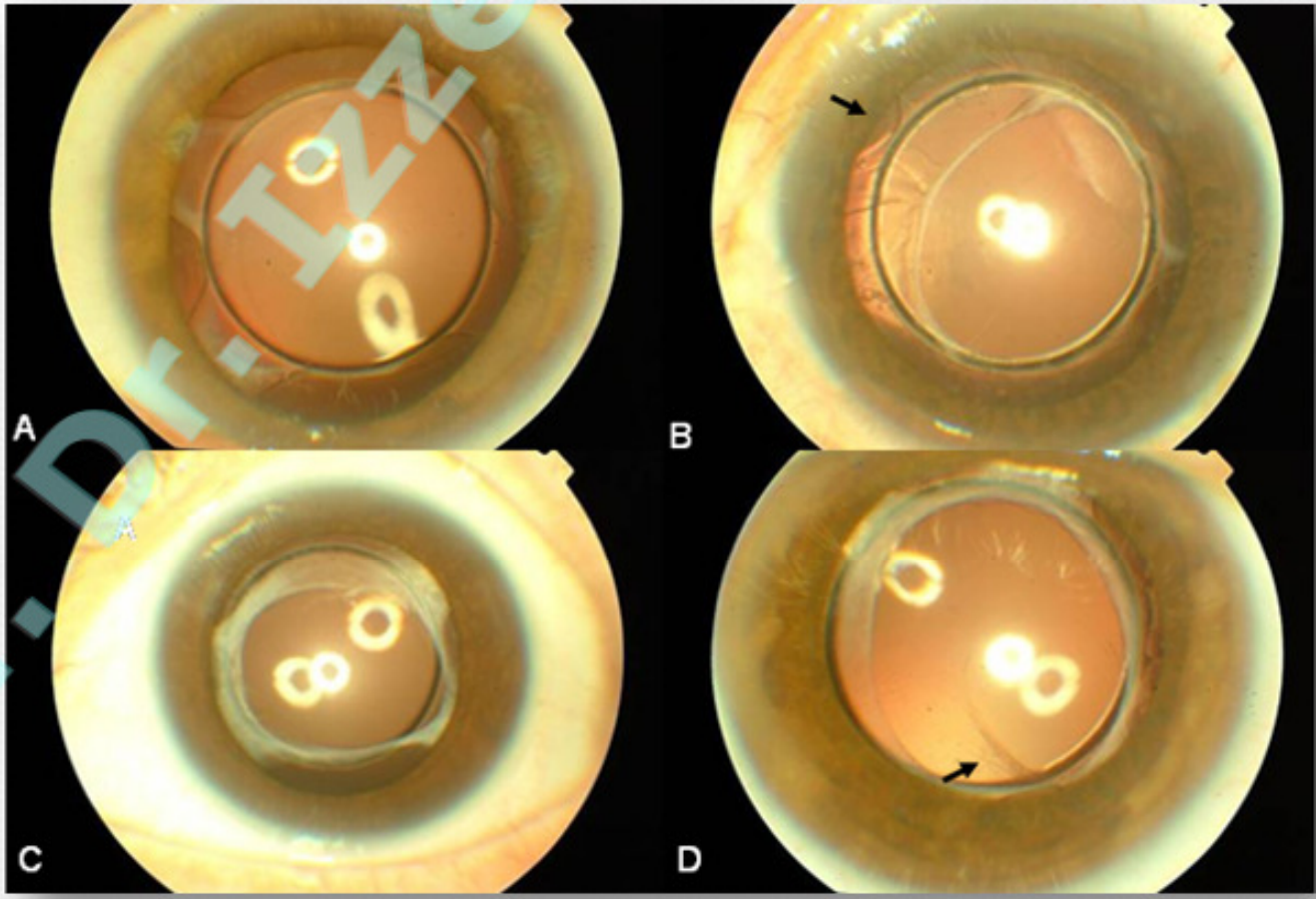
- 2.0 mm'den küçük kesilerden (tercihen 1.8 mm'den) geçebilmeli
- Katlandığında özelliklerini kaybetmemeli
- Kapsül içinde santralizasyonunu yitirmemeli stabil kalmalı
- Biyouyumluluğu iyi olmalı AKK'ne yol açmamalı
- Nitelikli GİL'lerinin özelliklerini de taşıyabilmeli
  - Monofokal
  - Torik
  - Asferik
  - Akomodatif
  - Multifokal

Can İ, Bostancı Ceran B. Micro-incision intraocular lenses (review). Ophthalmology International. 2011;6(3):74-9.

Küçük Kesili GİL'leri / Monofokal

- Akreos MI-60 (B+L)





- Hidrofilik akrilik, %26 su içeriği
- Çaplar: 5.6 / 6.2 ve 10.5 / 11.0 mm
- 360° köşeli kenar
- Asferik (0 µm)

Can İ, et al. J Cataract Refract Surg. 2010 ;36: 1905-11.

Küçük Kesili GİL'leri / Monofokal

- AcriSmart Lensleri (Zeiss Acri.Tec)

	Optik / Tüm Çap (mm)	Özellik
AcriSmart 36 A	6 / 11	asferik
AcriSmart46S	6/ 11	
AcriSmart46LC	6/ 11	asferik
AcriSmart48S	5.5 / 11	

•Alio JL, Rodriguez-Prats JL, Vianello A, Galal A. Visual outcome of microincision cataract surgery with implantation of an Acri.Smart lens. J Cataract Refract Surg 2005; 31: 1549-1556.

•Nochez Y, Majzoub S, Pisella PJ. Effects of spherical aberration on objective optical quality after microincision cataract surgery. J Fr Ophtalmol. 2010 ; 33: 16-22.

•Nochez Y, Favard A, Majzoub S, Pisella PJ. Measurement of corneal aberrations for customisation of intraocular lens asphericity: impact on quality of vision after micro-incision cataract surgery. Br J Ophthalmol 2010; 94: 440-444.

Küçük Kesili GİL'leri / Diğer Monofokal

HİDROFİLİK

- Ultrachoice 1.0 Lenses (Thinoptx, Abingdon, VA, USA)
- AcriFlex MICS IOL 46CSE (Acrimed GmbH, Berlin, Ger),
- CareFlex IOL (W20 Medizintechnik AG, Bruchal, Ger),
- SuperFlex and C-Flex (Rayacryl, Rayner IOL Ltd, UK),
- IOLTech MICS lens (LaRochelle, Fra and Carl Zeiss Meditec, Stuttgard, Ger),
- Microslim and SlimFlex (PhysIOL, Liege, Belgium)

HİDROFOBİK

- Hoya Y-60H (Hoya Corp. Tokyo, Japan)

HİDROFİLİK, HİDROFOBİK YÜZEY

- Acriva UDM 611 (VSY Technologies, İstanbul , Tur)

FLEKSİAKRİL HİBRİD AKRİLİK

- Miniflex IOL (Mediphacos Ltd, Minas Gerais, Brasil)

KOLLAMER

- NanoFlex (CC4204A) (Staar Surgical Co., Monrovia, Ca, USA)

Küçük Kesili GİL'leri / Torik

AT Lisa Toric 909M / MV

(=Acri Comfort 646TLC)

- 6 / 11 mm
- Hidrofobik yüzeyli hidrofilik

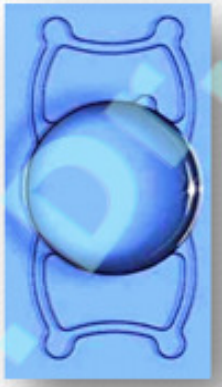
Acriva UD Toric T UDM611

- 6 / 11 mm
- Hidrofobik yüzeyli hidrofilik

Küçük Kesili GİL'leri / Akomodatif

TetraFlex KH-3500 micro-incision lens (Lenstec Inc, St. Petersburg, FL, USA)

- %26 su içerikli hidrofilik akrilik
- Çaplar: 5.75 / 11.5 mm
- 2.0 mm kesiden takılabilir.



1-CU: (Human Optics, Erlangen, Ger.)

- Hidrofilik akrilik
- Çaplar: 5.5 / 11.8 mm
- 2.0 mm kesiden takılabilir.

- Brown D, Dougherty P, Gills JP, Hunkeler J, Sanders DR, Sanders ML. Functional reading acuity and performance: Comparison of 2 accommodating intraocular lenses. J Cataract Refract Surg. 2009 ;35:1711-1714.
- Sanders DR, Sanders ML; Tetraflex Presbyopic IOL Study Group. US FDA clinical trial of the Tetraflex potentially accommodating IOL: comparison to concurrent age-matched monofocal controls. J Refract Surg. 2010; 26:723-730.

Küçük Kesili GİL'leri / Multifokal ve Multifokal Torik

- ***AT LISA (809 M / 809 MV)*** *(Acri.Lisa 366 D)*
- ***AT LISA Toric*** *(AcriLisa Toric 466 D)* (Carl Zeiss Meditec, Berlin, Germany) :

- **Acriva Reviol 611 MFM**
- **Acriva UD Toric T UDM611**(VSY Biotechnologies, İstanbul, Tur).

Küçük Kesili GİL'leri / Multifokal

ARTICLE IN PRESS

ARTICLE

Comparison of clinical outcomes with 2 small-incision diffractive multifocal intraocular lenses

İzzet Can, MD, Başak Bostancı Ceran, MD, Gülizar Soyugelen, MD, Tamer Takmaz, MD

PURPOSE: To evaluate and compare the clinical results of 2 diffractive multifocal small-incision intraocular lenses (IOLs) implanted after biaxial microincision cataract surgery (MICS).

SETTING: Atatürk Training and Research Hospital, 2nd Ophthalmology Department, Ankara, Turkey.

DESIGN: Comparative case series.

METHODS: Eyes that had biaxial MICS with implantation of an AcriLisa 366D IOL (Group 1) or Acriva Reviol MFM 611 IOL (Group 2) were followed for at least 6 months postoperatively. Uncorrected distance (UDVA), intermediate (UIVA), and near (UNVA) visual acuities; corrected distance visual acuity; distance-corrected intermediate and near visual acuities; and contrast sensitivity measurements with and without glare were determined. Early and late complications and subjective complaints were recorded and evaluated.

RESULTS: The study enrolled 60 eyes of 32 patients. The preoperative and intraoperative data were comparable in the 2 IOL groups. There were no statistically significant postoperative differences in the mean spherical equivalent (Group 1, −0.30 diopter (D) ± 0.30 [SD]; Group 2, −0.26 ± 0.28 D; $P=.584$), mean UDVA (0.80 ± 0.14 and 0.86 ± 0.17, respectively; $P=.158$), and mean Jaeger UNVA (1.46 ± 0.73 and J 1.23 ± 0.50, respectively; $P=.155$). However, there was a significant difference in mean Jaeger UIVA (3.06 ± 0.90 and 2.23 ± 0.72, respectively; $P=.000$). Mesopic contrast sensitivity and the incidence of complications and dysphotopsia symptoms were not significantly different between the 2 IOL groups.

CONCLUSIONS: Both IOLs provided excellent distance and near visual acuity and contrast sensitivity. The Group 2 IOL gave better intermediate distance results.

Financial Disclosure: No author has a financial or proprietary interest in any material or method mentioned.

J Cataract Refract Surg 2011; ■:■–■ © 2011 ASCRS and ESCRS

Olgu sayısı:

30 göz; AcriLisa 366 D

30 göz; Acriva Reviol 611 MFM

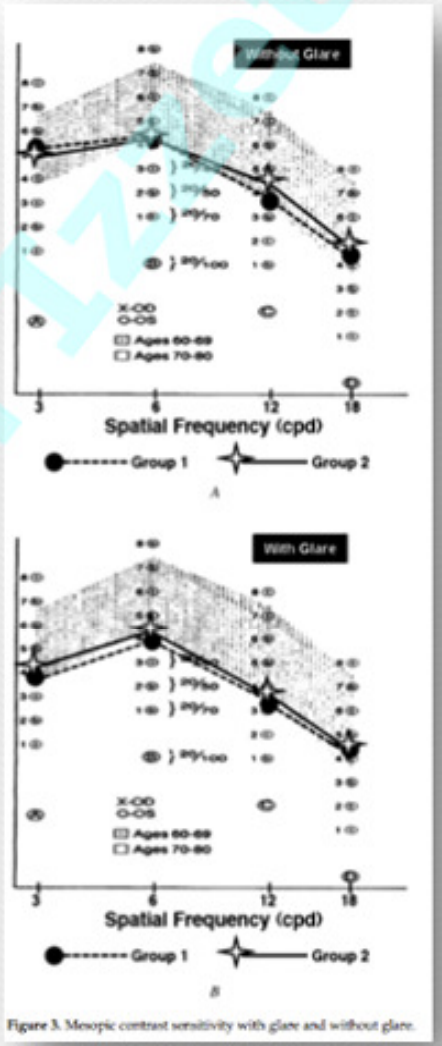
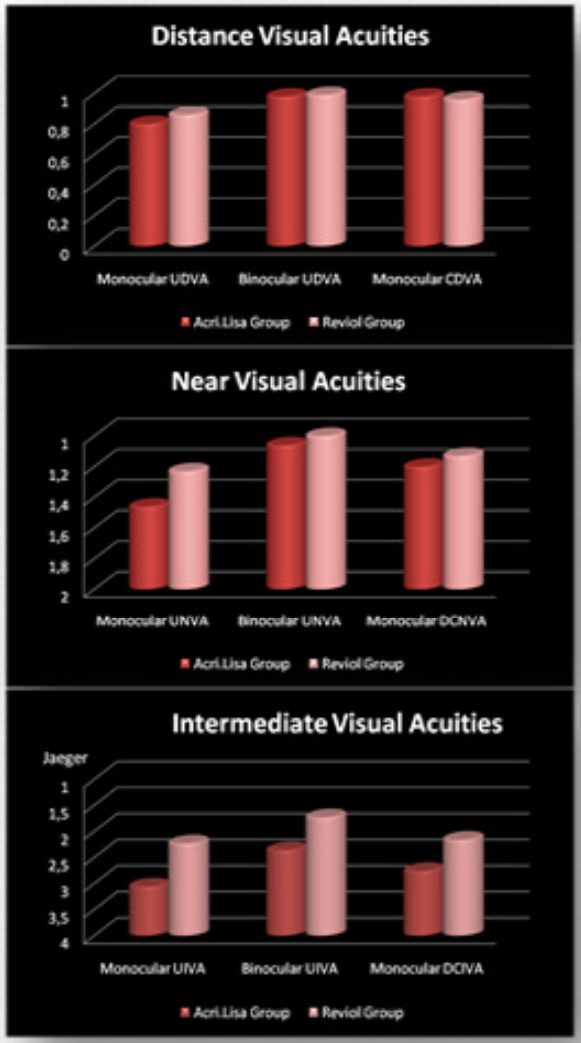
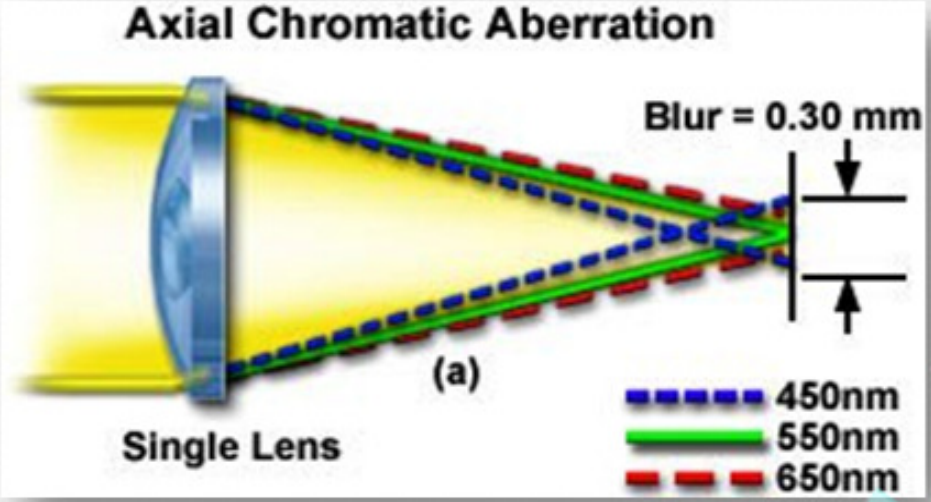


Figure 3. Mesopic contrast sensitivity with glare and without glare.



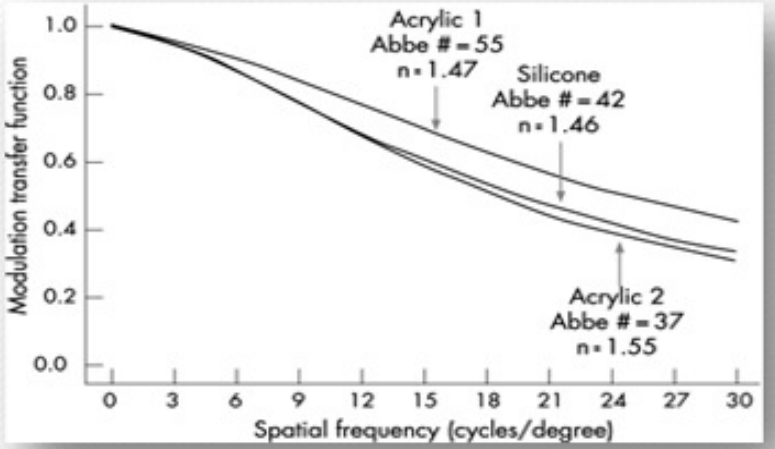
Kromatik Aberasyon ??



- Abbe Sayısı
- $V_d = (n_d - 1)/(n_F - n_C)$
  - $n_{d=}$ 587 nm'de kırma indeksi
  - n_F= 486 nm'de kırma indeksi
  - $n_{C=}$ 656 nm'de kırma indeksi
  - Negishi K et al. Effect of chromatic aberration on contrast sensitivity in pseudophacic eyes. Arch Ophthalmol 2001; 119: 1154-8.
  - Zhao H, Mainster MA.The effect of chromatic dispersion on pseudophakic optical performance. Br J Ophthalmol. 2007;91(9):1225-1229.

Lens	Kırma indeksi	Abbe Sayısı
Doğal Kristal Lens	1.40	47
Alcon Akrilik AcrySof SA60AT ve SN60AT	1.55	37
AMO Akrilik Tecnis ZA9003	1.47	55
AMO Silikon Tecnis Z 9002	1.46	42
Hoya Akrilik Hoya YA 60BB	1.51	43
AnadoluTıp Akrilik Focus Force	1.51	45

Br J Ophthalmol. 2007;91(9):1225-1229.



Asferik GİL'leri

- Sferik aberasyonların azalmasının bir dezavantajı foküs derinliğinin azalmasıdır.

Markos et al. J Cataract Refract Surg. 2005; 21: 223-35

Nio et al. Ophthalmic Physiol 2002; 22: 103-12.

- Asferik GİL'i ameliyat sonrası 0,4 mm. içinde santralize olmalı ve 7° den fazla tilt göstermemelidir. Aksi takdirde daha fazla YSA'ları üretirler.

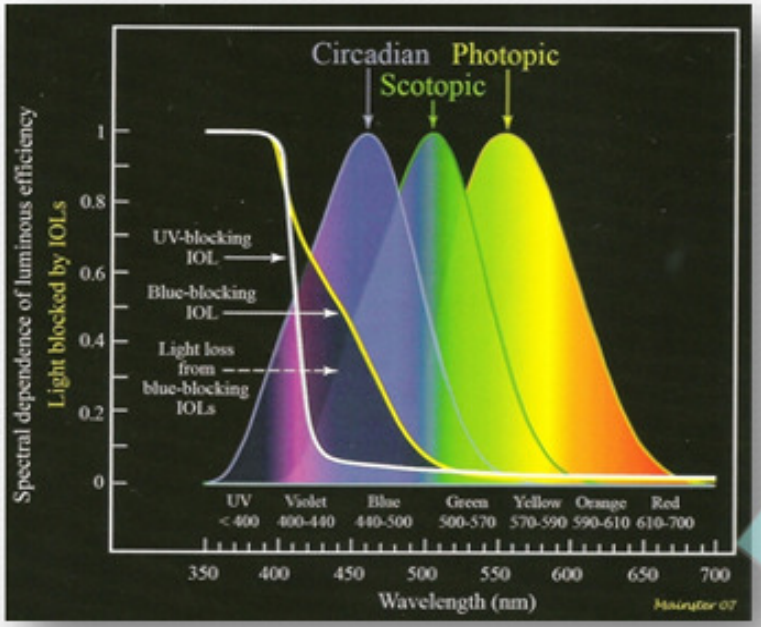
Holladay JT et al. J Refract Surg 2002; 18: 683-9.

Wang et al. Arch Ophthalmol, 2005; 123; 1226-30.

Negatif Aberrasyonlu GİL'ler	
•AMO-Tecnis	- 0.27 µm
•Alcon -Acrysof IQ	- 0.20 µm
•VSY –AcrivaUD	- 0.165 µm
•PhysIOL-FineVision Micro F	- 0.11 µm
•Alcon -Restor	- 0.10 µm
Sıfır Aberrasyonlu GİL'ler	
•B&L –Akreos ve Sofport	0 µm
•AnadoluTıp-Focus Force	0 µm

Denoyer A et al. Comparative study of aspheric intraocular lenses with negative spherical aberration or no aberration. J Cataract Refract Surg 2009; 35: 496-503.

Kısa Dalga Boylu Işık Filtrelemesi

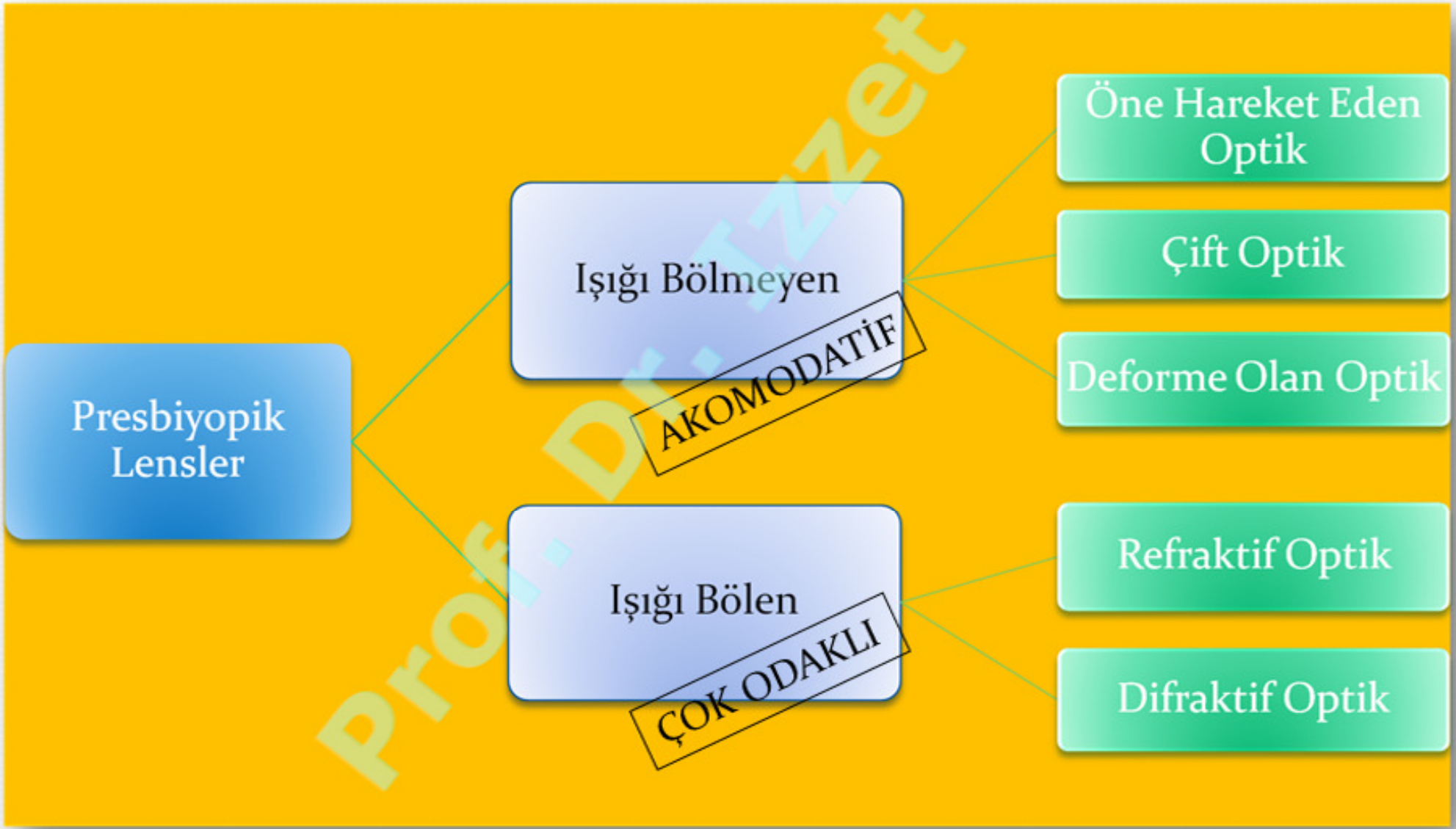


1. YBMD'ını önler ve zararı yoktur.
2. YBMD'ını önlemez ve zararı vardır.
3. YBMD'ını önlemez ve zararı yoktur.

- **Sirkadien algılama λ max= 460 nm**
- **Skotopik algılama λ max= 500 nm**
- **Fotopik algılama λ max= 555 nm**

- **Mavi ışık Sirkadien algılamanın %55,**
- **Skotopik algılamanın %35'inden sorumlu.**

Presbiyopi Düzelten GİL'leri



Presbiyopi Düzeltme / Akomodatif

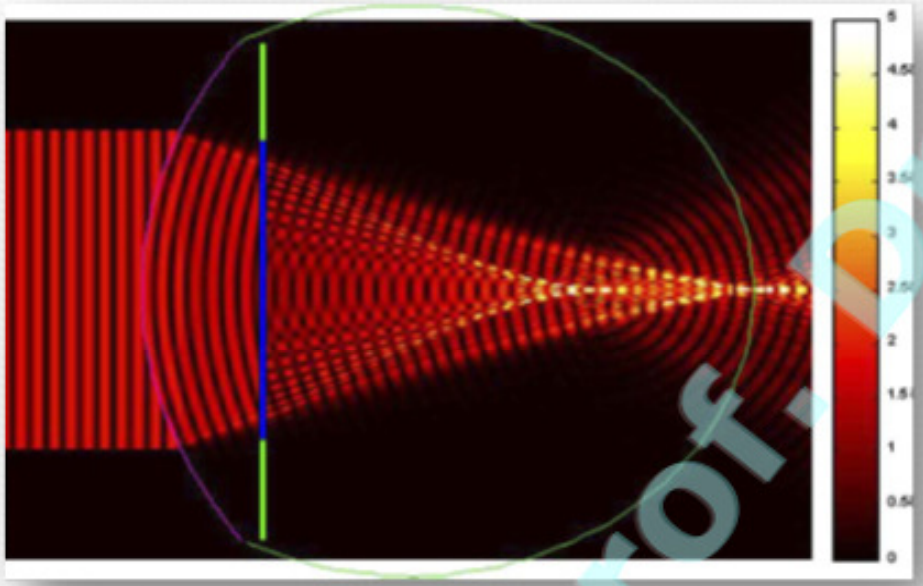
Presbiyopi Düzeltme / Akomodatif

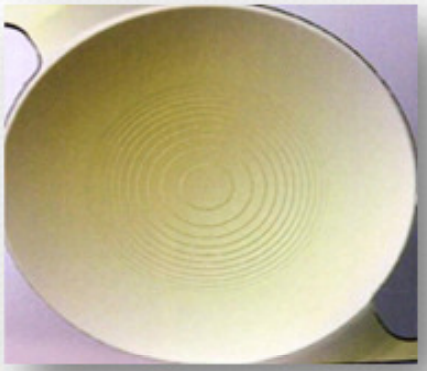
Avantajları

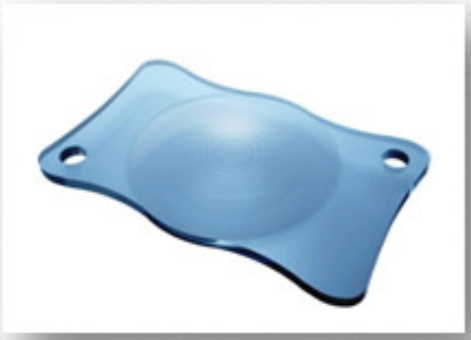
1. Yüksek görme kalitesi
   - Kontrast duyarlılık kaybı yok
2. Gece belirtilerinin olmayışı
3. Sürekli akomodasyon aralığı

Presbiyopi Düzeltme / Difraktif

- Pupil büyüklüğünden en az etkilenir.
- Yakın odakta kromatik aberasyonları düzeltir







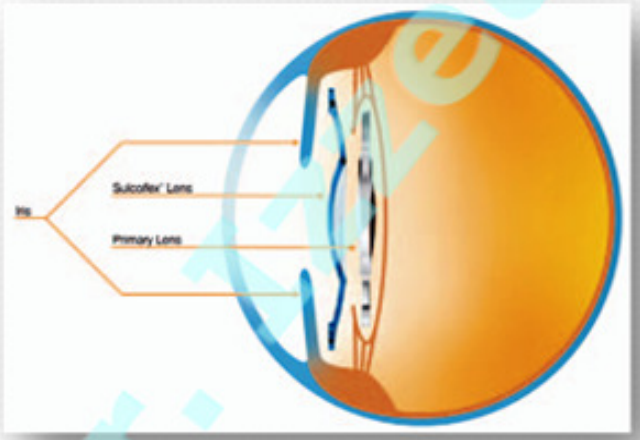
Yeni Seçenekler/ Trifokal

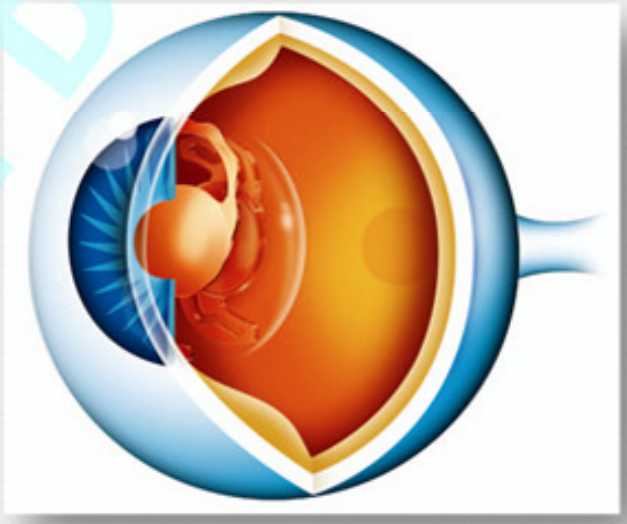
- FineVision Micro F (PhysIOL, Bel)
- İki difraktif yapının kombinasyonu
  - Uzak- Yakın +3.5 D.
  - Uzak- Ara +1.75 D.
- Uygulama 1.8-2.0 m kesiden
- Çaplar: 6.15 / 10.75 mm
- %25 su içerikli hidrofilik akrilik

Yeni Seçenekler /PiggyBack (Duet) Lens Uygulaması

Sulcoflex (Rayner, UK)

- Hidrofilik akrilik
- Çaplar:
  - 6.50/ 14.0 mm
- Haptik açısı: 10° posterior
- Optik: Ön konveks, arka konkav, yuvarlak kenarlı, Asferik
- Küçük kesiye uygun (< 2.0 mm)
- Güç: -10.0 / + 10.0 D.
- Amon M. 2011, Astle WF. 2011, Bleik J. 2011, Mehta KR. 2011.





Nasıl Bir GİL / Özet

- Materyal
- Küçük kesi GİL
- Kromatik aberasyon
- Sferik aberasyon düzeltme
- Kısa dalga boylu ışık filtrelemesi
- Presbiyopi düzeltme
- Piggyback yaklaşım

İlginize
Teşekkürler

Sapanca,
Kasım 2011