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# Bimanual microincision cataract surgery with implantation of an Akreos MI60 lens – one year follow-up

**Operacja zaćmy z mikrocięcia rogówki techniką dwuręczną z jednoczesnym wszczepem soczewki wewnątrzgałkowej Akreos MI60 – obserwacje roczne**

**Podborczyńska-Jodko Karolina, Lubiński Wojciech**

Department of Ophthalmology, Pomeranian Medical University, Szczecin, Poland  
Head: Professor Lubiński Wojciech MD, PhD

**Streszczenie:** Cel: ocena funkcji wzroku oraz powikłań po operacji zaćmy z mikrocięcia rogówki techniką dwuręczną z jednoczesnym wszczepem soczewki Akreos MI60.  
**Metoda:** badaniem objęto 40 oczu (22 pacjentów), które poddano operacji zaćmy z jednoczesnym wszczepem soczewki Akreos MI60 przez cięcie rogówkowe nieprzekraczające 1,9 mm. Rok po operacji badano ostrość wzroku do dali i bliży (logMAR), czułość kontrastową (CS) (CSV-1000), indukowany astygmatyzm (analiza wektorowa), powikłania pooperacyjne oraz stopień zadowolenia pacjentów.  
**Wyniki:** soczewkę Akreos MI60 implantowano przez cięcie o średnicy  $1,8 \pm 0,01$  mm. Rok po operacji średnia, nieskorygowana ostrość wzroku do dali (UDVA) i najlepiej skorygowana ostrość wzroku do dali (CDVA) (UDVA przedoperacyjna –  $0,7 \pm 0,6$ ; pooperacyjna –  $0,04 \pm 0,17$ ;  $p < 0,005$ ; CDVA przedoperacyjna –  $0,61 \pm 0,6$ ; pooperacyjna –  $0,01 \pm 0,12$ ;  $p < 0,005$ ), jak również do bliży (CNVA) (CNVA przedoperacyjna –  $0,56 \pm 0,42$ ; pooperacyjna –  $0,00 \pm 0$ ;  $p < 0,005$ ) uległy istotnej poprawie. Czułość kontrastowa w adaptacji fotopowej była w granicach normy wiekowej. Nie stwierdzono istotnego indukowanego astygmatyzmu pooperacyjnego. Rok po operacji nie zaobserwowano poważnych powikłań. Zmętnienie tylnej torby wymagające kapsulotomii wystąpiło u 1 pacjenta. Wszyscy pacjenci byli bardzo zadowoleni z jakości widzenia.  
**Wnioski:** operacja zaćmy z mikrocięcia rogówki techniką dwuręczną z jednoczesnym wszczepem soczewki Akreos MI60 jest techniką operacyjną, która pozwala na uzyskanie bardzo dobrych wyników funkcjonalnych, szybkiej rehabilitacji wzrokowej i w związku z tym satysfakcji pacjentów z przeprowadzonego zabiegu.

**Słowa kluczowe:** MICS, Akreos MI60, funkcja wzroku, powikłania.

**Summary:** **Purpose:** To evaluate visual outcome and complications after bimanual microincision cataract surgery (MICS) with implantation of an Akreos MI60 intraocular lens (IOL).  
**Material and method:** This study comprised 40 eyes of 22 patients after MICS. The IOL was implanted through a 1.9 mm or smaller clear corneal incision. One year after operation, uncorrected and best corrected distance visual acuity, best corrected near visual acuity (logMAR), contrast sensitivities (CS) (CSV-1000), induce astigmatism, complications and patient satisfaction were analyzed.  
**Results:** The Akreos lens was implanted through mean incision of  $1.8 \pm 0.01$  mm. One year after surgery the mean uncorrected and the best corrected distance visual acuity (UDVA, BCDVA) and the best corrected near visual acuity (BCNVA) significantly improved (UDVA: preoperatively –  $0.7 \pm 0.6$ ; postoperatively –  $0.04 \pm 0.17$ ;  $p < 0.005$ ; BCDVA: preoperatively  $0.61 \pm 0.6$ ; postoperatively –  $0.01 \pm 0.12$ ;  $p < 0.001$ ; BCNVA: preoperatively –  $0.56 \pm 0.42$ ; postoperatively –  $0.0 \pm 0$ ;  $p < 0.005$ ). CS in photopic adaptation were within normal age-matched limits. One year after surgery, there was not significant induced astigmatism measured by vector analysis. There were no serious postoperative complications. Visual significant PCO was observed in 1 patient. All the patients were highly satisfied with the quality of the vision.  
**Conclusions:** Our results show that MICS with Akreos MI60 lens implantation is a procedure which let receive very good visual function results, fast visual rehabilitation as well as high patients' satisfaction.

**Key words:** MICS, Akreos MI60, visual function, complications.

## Introduction

Microincision cataract surgery (MICS) is defined as an operation performed by incision less than 2 mm (1).

This minimally invasive technique provides better stabilization of the wound and faster visual rehabilitation. A significant

decrease of eye injury, a better stabilization of wounds and minimal surgically induced astigmatism, as well as significant reduction of intra- and postoperative complications are further advantages of the procedure MICS. Following the "operational trends", a number of lenses that can be implanted by an incision of less than 2 mm is growing up.

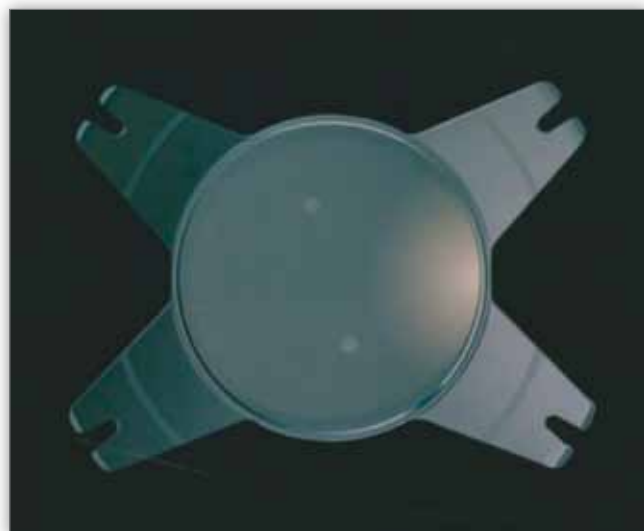
The one of this lenses is an Akreos MI60 (Bausch & Lomb). Up to date in the polish literature there was no study describing visual outcomes in patients after implantation of this type of lens. That is way, we decided to evaluate visual outcome and complications one year after bimanual microincision cataract surgery (MICS) according to Alio and al methods (2-4) with implantation of an Akreos MI60 intraocular lens (IOL). The MICS procedure has performed in our clinic since 2005 (5).

**Material and methods**

The study comprised 40 eyes of 22 patients (10 females, 12 males), with a mean age of  $54.23 \pm 23.34$  years undergoing cataract surgery (Emery Little classification: A1-2 , C2-6, H4-5, F3-27 eyes), with binocular implantation of Akreos MI60 lenses.

Exclusion criteria included other ophthalmic diseases, pseudophakia in one eye, astigmatism >2.00 D.

Akreos MI60 is an one piece with 4 haptics, aspheric, acrylic-hydrophilic, containing 26% water lens. It is a bi-convex lens with sharp edges, a diameter of the optic part and the total diameter are equal 5.5–6.2 mm and 10.5–11 mm, respectively. The lens can be implanted into the eye by clear corneal incision with a diameter of about 1.8 mm, using the LP 604 350 injector (Fig. 1).



**Fig. 1.** Akreos MI60 lens.  
**Ryc. 1.** Soczewka Akreos MI60.

The surgeries were performed by one surgeon (L. W.) in topical anesthesia (Proxymetacaini hydrochloride – Alcaine). The lens was removed with bimanual technique from corneal microincisions (mean 1.2 x 1.4 mm) at a distance of 90° from each other. The anterior chamber was filled with viscoelastic (Discovisc). Circular capsulorhexis diameter was approximately 5 mm. After hydrodissection, delineation and fragmentation of nuclei with 2 phacochoppers according to the method described by Alio et al. (2), the lens was removed by ultrasound phacoemulsification – low power Fako – mean 9% (Infinity).

After bimanual irrigation and aspiration of cortical masses one of the corneal incisions was widened to approximately 1.8 mm and through this incision an Akreos MI60 was implanted. Target refraction was emetropia, and IOL power calculations were done using IOL Master (Carl Zeiss-Meditec, Jena, Germany – the software version 2005, A-constant recommended

by the manufacturer with SRK-T formula). Final incision size after IOL implantation was measure with a special caliper (Asico). After evacuation of viscoelastic from the anterior chamber, hydration of the wound edges in order to increase its tightness were performed. After the surgery 3 times a day for 3 weeks an antibiotic and corticosteroid drops were used.

Follow-up examinations were performed by an independent investigator before and 1 year after surgery.

Before and 12 months after surgery the following examinations were performed: uncorrected and the best corrected distance visual acuities (UDVA, BCDVA), the best corrected near visual acuity (BCNVA) (EDTRS table). At the end of surgery final incision size was measured. One year after surgical induced astigmatism (SIA – vector analysis), the best corrected photopic (85cd/m2) contrast sensitivity (CS) for distance with and without glare [CSV-1000; 3, 6 12, 18 cycles/degree (cpd)], postoperative complications, subjective symptoms and patients satisfaction were analyzed.

Visual acuity, contrast sensitivity results before and 12 months post operation were compared using the Wilcoxon test. A p value less than 0.05 was considered as a statistically significant.

**Results**

**Final corneal incision size**

Mean of final corneal incision size after implantation of Akreos 60MI was equal  $1.80 \pm 0.01$  mm (range, 1.7 to 1.9 mm). Incision of 1.7 mm was achieved in 3 eyes, 1.8 mm in the next 34 eyes, in 3 eyes was 1.9 mm.

**Visual acuity for distance**

Mean of UDVA and of BCDVA for distance are shown in Table I.

	Przed operacją/ Before surgery	Po operacji/ After surgery	Poziom istotności/ Significance level
UDVA	$0.70 \pm 0.6$	$0.04 \pm 0.17$	$p < 0.005$
BCDVA	$0.61 \pm 0.6$	$0.01 \pm 0.12$	$p < 0.005$

**Tab. I.** The mean of UDVA and BCDVA.  
**Tab. I.** Średnie UDVA i BCDVA.

One year after surgery BCDVA and UDVA were significantly improved in comparison to preoperative values ( $p < 0.005$ ). One year after surgery 10% of patients required only slight correction glasses (average + 0.125 D) for 0.0 and better vision. One year after surgery in 77.5% of patients visual acuity without correction was 0.1 logMAR and better.

**Visual acuity for near**

One year after surgery, the mean of the BCNVA was statistically better in comparison to preoperative values (before surgery –  $0.56 \pm 0.42$ ; after surgery –  $0.0 \pm 0.0$ ;  $p < 0.05$ ).

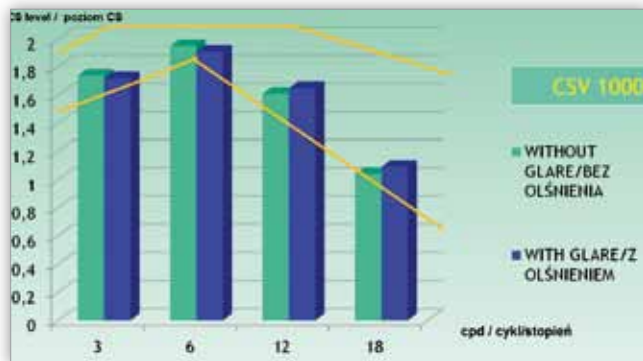
**Refraction**

One year after surgery, the mean value of spherical refractive error for distance was significantly lower (before surgery

–  $0.52 \pm 1.46$  D, range from  $-4.00$  to  $+2.75$ ; after surgery –  $0.16 \pm 0.36$  D, range from  $-1.50$  to  $+1.50$  D;  $p < 0.05$ ). The SIA mean one year after surgery was  $0.42$  D.

### Contrast sensitivities

The mean photopic, the best corrected CS for distance with and without glare were within normal limits in comparison to the normal population between 50 and 75 years old (Fig. 2).



**Fig. 2.** The means of photopic, the best corrected CS for distance without and with glare in comparison to the normal population in age 50–75 years old (yellow line).

**Ryc. 2.** Średnie fopowe, najlepiej skorygowane CS do dali bez oślnienia i z oślnieniem w porównaniu z tymi samymi parametrami u osób z grupy zdrowych w wieku 50–75 lat (żółta linia).

### Postoperative complications

No patient had a surgical wound leaks or burns of the cornea. One year after surgery in 2 eyes significant posterior capsule opacifications were detected and successful YAG laser treatment was performed.

### Patient satisfaction and subjective symptoms

All patients were very satisfied with the quality of vision. None patient had unwanted effects (glare, halo).

### Discussion

The modern technology using ultrasound or laser energy allows the removal of cataract by an incision of 2.0 mm and less.

There are different types of lenses that can be implanted by corneal microincision such as Acri.Smart (Zeiss), ThinOptX UltraChoice 1.0 (ThinOptX Inc), SuperFlex (Rayacryl Rayner Intraocular lenses Ltd) and others (6-8).

In the study group, the lens folding and unfolding in the natural lens capsule was very fast and under control. There were no cases of lens damage during the implantation. It should be noted that the implantation of the lens with 1.7–1.8 mm incision was possible without any technical problems.

In our study, the mean corneal incision size, finally after implantation Akreos 60MI was consistent with the average published by Alio et al. ( $1.82 \pm 0.16$  mm) (4).

Analysis of the obtained visual acuity results indicated a significant improvement of uncorrected and the best corrected visual acuity for distance and the best corrected near vision. One year after surgery, in 80% of eyes UDVA was equal 0.1 logMAR or better, and significant improvement BCDVA was obtained. All patients received the BCNVA equal 0.0 logMAR. These very good visual acuity results for distance and near,

even better (Table I) than reported by Alio et al. (UDVA  $0.04 \pm 0.17$  and  $0.32 \pm 0.23$ , BCDVA  $0.01 \pm 0.12$  and  $0.08 \pm 0.16$ ) (4), were achieved because a very restrictive inclusion criteria were used.

In our group of patients, vector analysis of the SIA revealed the value below 0.50 D and confirmed that MICS procedure do not create significant postoperative astigmatism. Obtained mean SIA ( $0.42$  D) was consistent with the results described by others performing MICS surgery with Acri.Smart 48S. Some researchers observed even slightly greater SIA (Alio et al.  $0.50$  D and more) (8-10).

No significant decentration, tilt or structural damage of the lens during implantation pointed to the high quality of the presented IOL model. Sharp edges of the lens optic and haptic reduced the early incidence of posterior capsule opacification (PCO). One year after surgery in 20% of eyes not significant PCO was observed, but only in 5% eyes YAG laser capsulotomy was necessary. Alio et al. reported in 36% of eyes posterior capsule opacification in the same observation time. The higher percentage of PCO in Alio study in comparison with presented study results is probably related with smaller study group (4,11).

In our study, the results of contrast sensitivity for distance were within normal limits of healthy people in the same range of age indicated very good performance of this type of IOL (12). There were no complications during and after surgery. The patients were highly satisfied with the quality of performed procedures and implanted lenses due to the fact that they received mostly very good, uncorrected visual acuity for distance in the absence of subjective symptoms (glare, halo).

In summary, the results of presented study suggest that MICS with Akreos MI60 lens implantation is a procedure which provide for the patient very good visual function as well as high patients' satisfaction. So, we would recommend the MICS and this type of IOLs for the cataract surgeons and patients.

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**Reprint requests to (Adres do korespondencji):**

**prof. Wojciech Lubiński**  
**Katedra i Klinika Okulistyki PUM**  
**ul. Powstańców Wlkp. 72**  
**70-111 Szczecin**  
**e-mail: lubinski@pro.onet.pl**



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