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# Phacoemulsification with implantation of Morcher aniridia capsular rings for postoperative atonic pupil after iridencleisis – case report

**Fakoemulsyfikacja z implantacją pierścienia torebkowego Morcher z powodu atonicznej źrenicy po iridencleisis – opis przypadku**

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<b>Abstract:</b>	<p><b>Introduction:</b> Large iris defects, aniridia or wide atonic pupil may cause disturbing photoptic phenomena and may require surgical treatment. In acquired iris defects, ophthalmologists have a relatively wide choice of therapeutic strategies, which depend on the size and etiology of the defect and the co-morbidities. The goal of treatment is to restore iris diaphragm and to reconstruct the pupil in order to prevent glare and to increase the quality of perceived image.</p> <p><b>Case report:</b> We present a case of cataract and unilateral wide, atonic pupil in a patient 39 years after iridencleisis, who complained of intense glare in the left eye and photophobia ever since. The patient was successfully treated by phacoemulsification through a 2.75 mm clear corneal incision with implantation of two black Morcher aniridia capsular rings.</p> <p>The patient experienced a significant improvement in her subjective quality of vision and a constant glare that she had been experiencing for years resolved.</p> <p><b>Conclusions:</b> The presented case indicates that Morcher aniridia capsular rings may be a good tool instrument to assist the surgeon in cases of cataract concomitant with wide and atonic pupil. Using these rings reduces glare and improves the subjective quality of patients' vision.</p>
<b>Key words:</b>	atonic pupil, phacoemulsification, iridencleisis, Morcher ring, artificial iris.
<b>Abstrakt:</b>	<p><b>Wstęp:</b> znacznych rozmiarów ubytki tęczęwki, aniridia lub szeroka i atoniczna źrenica mogą powodować wiele niepożądanych zjawisk optycznych, które mogą wymagać leczenia chirurgicznego. W przypadku nabytych uszkodzeń tęczęwki okuliści mają do wyboru wiele możliwych strategii terapeutycznych, które zależą od rozmiarów i etiologii uszkodzenia oraz chorób współistniejących.</p> <p><b>Cel:</b> celem leczenia są wówczas przywrócenie przesłony, którą tworzy tęczęwka, oraz rekonstrukcja źrenicy, to eliminuje zjawisko olśnienia i poprawia jakość postrzeganego obrazu.</p> <p><b>Opis przypadku:</b> chora na zaćmę z jednostronnie szeroką i atoniczną źrenicą w oku, w którym 39 lat wcześniej wykonano zabieg przeciwjaskrowy iridencleisis. Od tamtej pory pacjentka skarżyła się na intensywne olśnienie w oku lewym i światłowstręt. Pacjentkę poddano zabiegowi fakoemulsyfikacji przez cięcie w czystej rogówce o szerokości 2,75 mm, z jednoczesną implantacją dwóch czarnych pierścieni torebkowych Morcher. W efekcie tego zabiegu nastąpiła znaczna subiektywna poprawa jakości widzenia, ustąpiło też zjawisko olśnienia, którego pacjentka doznawała od wielu lat.</p> <p><b>Wnioski:</b> opisywany przypadek wskazuje, że pierścienie torebkowe Morcher są przydatnym narzędziem, które może być pomocne w przypadku współistnienia zaćmy z szeroką i atoniczną źrenicą. Zastosowanie pierścieni torebkowych Morcher powoduje redukcję olśnienia i poprawia subiektywną jakość widzenia.</p>
<b>Słowa kluczowe:</b>	atoniczna źrenica, fakoemulsyfikacja, iridencleisis, pierścień Morchera, sztuczna tęczęwka.

## Introduction

Large iris defects, aniridia or wide atonic pupil may cause disturbing photoptic phenomena and may require surgical treatment. In acquired iris defects, ophthalmologists have a relatively wide choice of therapeutic strategies, which depend on the size and etiology of the defect and the co-morbidities. An appropriate choice of treatment method for a specific type of defect in view of other coexisting ocular defects is crucial. The goal of treatment

is to restore iris diaphragm and to reconstruct the pupil in order to prevent glare and to increase the quality of perceived image (1).

## Case report

We present a case of unilateral wide and atonic pupil in a 74-year-old woman who presented for the elective cataract surgery. She noticed a slow, progressive decrease in her visual acuity in the left eye for the last few years.

Her previous medical history included long-term medical and surgical treatment for primary closed-angle glaucoma. Phacoemulsification and trabeculectomy were performed in her right eye a few years ago and the right pupil looked normal.

Iridencleisis was performed in her left eye 39 years ago, leaving the pupil dilated. The patient complained of intense glare and photophobia in the left eye ever since.

Currently, she was not using any glaucoma medication, as the procedures contributed to the good control of her intraocular pressure (IOP).

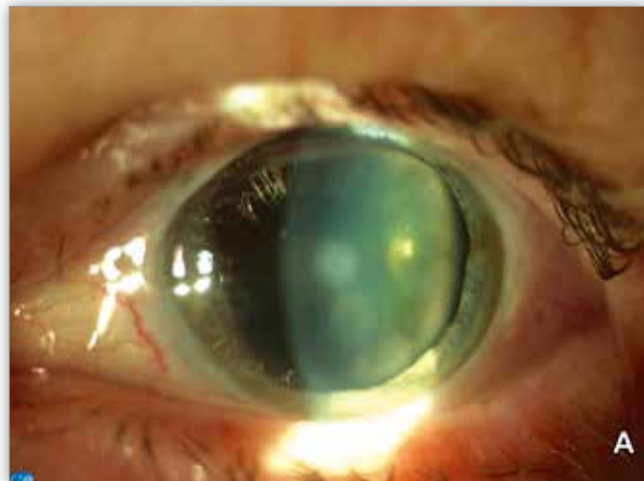
A complete ophthalmic examination was performed, including the best corrected visual acuity using standard Snellen charts, tonometry, slit-lamp biomicroscopy, funduscopy and the optical coherence tomography (OCT) of the anterior segment of the eye.

On admission, the best corrected distance visual acuity (BCDVA) was 1.0 cc -1.0 Dsph in the right eye and 0.4 cc +5.0 Dsph +1.75 Dcyl ax 55 in the left eye.

IOP was 12 mmHg in the right eye and approximately 4 mmHg in the left eye.

In the right eye a normal filtering bleb, a posterior chamber intraocular lens (PC IOL) implanted in the bag and a central and normally looking pupil were shown.

In the left eye a filtering bleb, narrow anterior chamber, nuclear cataract and a wide pupil which unresponsive to light, accommodation (Fig. 1A) and pharmacologic agents (miotics) were shown. Fundus examination revealed clear vitreous and slightly pale optic discs with increased c/d ratio.



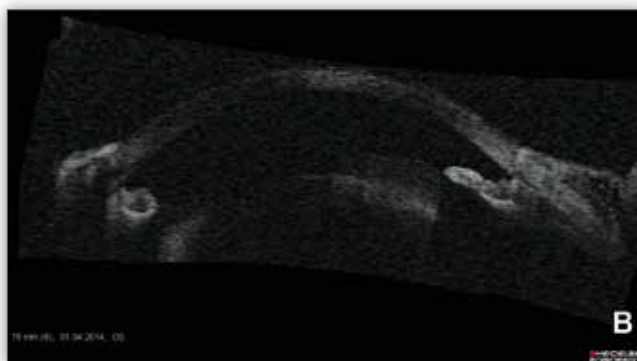
**Fig. 1A.** Color photograph on admission, showing a wide atonic pupil and a nuclear cataract. The pupil was not dilated pharmacologically.

**Ryc. 1A.** Kolorowa fotografia, którą wykonano podczas przyjmowania pacjenta do kliniki, ukazuje szeroką atoniczną źrenicę i zaćmę jądrową. Źrenica nie była rozszerzana farmakologicznie.

A shallow anterior chamber was visualised using the slit lamp adapted optical coherent tomography, (SL-OCT, Heidelberg Engineering, Germany) (Fig. 1B).

Phacoemulsification was performed under local, topical anaesthesia – proxymetacaine hydrochloride (Alcaine, Alcon, USA) eyedrops, 2% Lidocaine gel (Lignocainum, Jelfa, Poland) and 1% intracameral Lidocaine solution.

As the pupil had already been dilated, no mydriatic agents were used preoperatively. The surgery was performed using “di-



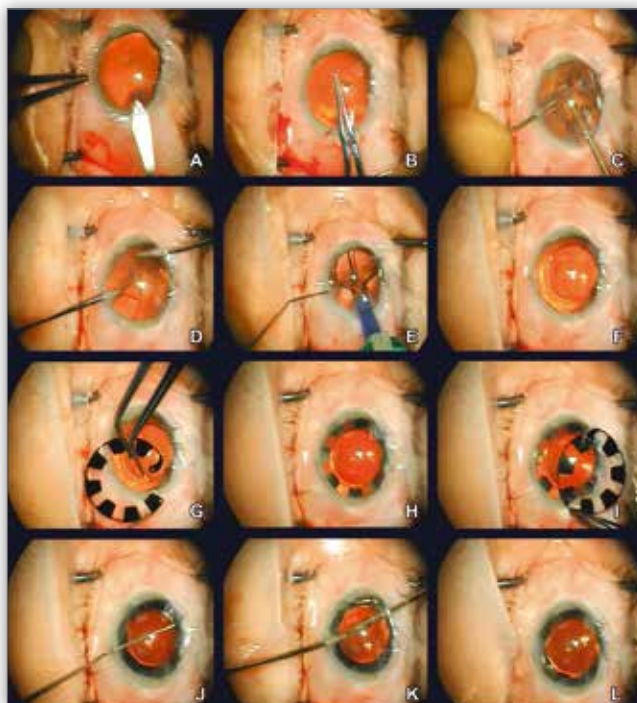
**Fig. 1B.** SL-OCT of the anterior segment showing a wide pupil and a shallow anterior chamber.

**Ryc. 1B.** Badanie SL-OCT przedniego odcinka – widoczne są szeroka źrenica i płytka komora przednia.

vide and conquer” technique for chopping the nucleus. Hydroxypropyl methylcellulose 2% (Celofal, Alcon, USA) was used as an ophthalmic viscosurgical device (OVD) and balanced salt solution (BSS, Alcon, USA) was used as the infusion fluid.

A self-sealing, 2.75 mm wide, single plane, clear corneal incision was created temporally with a 2.75 mm metal slit knife (Fig. 2A). A continuous curvilinear capsulorhexis was done with Utrata forceps under an ophthalmic viscosurgical device (OVD) (Fig. 2B). Two side-ports were created with a 20-gauge microvitrectomy (MVR) blade in the clear cornea, 90 degrees from the main incision. Phacoemulsification (Fig. 2C) and aspiration (Fig. 2D) were performed subsequently.

The anterior chamber was filled with an OVD and a single-piece acrylic foldable lens (Aspira, Human Optics, Germany) was implanted with an injector through the main incision (Fig. 2E, F).



**Fig. 2.** Phacoemulsification with implantation of two Morcher rings (see description in the text).

**Ryc. 2.** Fakoemulsyfikacja z implantacją dwóch pierścieni Morcher (opis w tekście).

In cases of aniridia various rings can be applied. In order to reduce constant glare, two black single-piece PEMA Morcher aniridia rings (Type 50C) were consecutively implanted in the bag, with forceps, through the main incision (Fig. 2G, H, I). The second ring was slightly rotated clockwise (about 30 degrees), so that black segments of the second ring covered gaps of the first ring, thus creating a continuous diaphragm and artificial equivalent of the pupil (Fig. 2J, K, L).

Postoperative treatment included topical combination of tobramycin-dexamethasone (Tobradex) eyedrops 4 times daily for 3 weeks after the surgery.

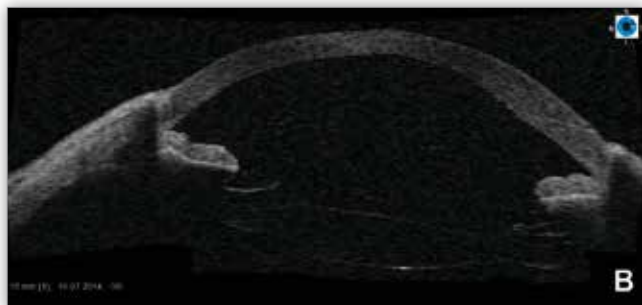
On discharge, one week later, the uncorrected visual acuity in the left eye was 0.7 and the IOP was 5 mmHg. The pupil was still wide and atonic, PC IOL was located in the bag and two capsular Morcher aniridia rings were visible (Fig. 3A). SL-OCT of the anterior segment confirmed proper fixation of PC IOL and Morcher rings and the unchanged dilated pupil (Fig. 3B).

Although the objectively measured BCDVA was similar to preoperative values, the patient reported a significant improvement in her subjective quality of vision and a constant glare that she had been experiencing for years resolved.



**Fig. 3A.** Color photograph at discharge, showing a wide atonic pupil, PC IOL located in the bag and two capsular Morcher rings (type 50C) rotated one segment-wide apart from each other.

**Ryc. 3A.** Kolorowa fotografia, którą wykonano w dniu wypisu, ukazuje szeroką atoniczną źrenicę, PC IOL w torbie soczewki i dwa pierścienie Morcher (tpu 50C) zrotowane o szerokość jednego segmentu.



**Fig. 3B.** SL-OCT of the anterior segment showing a wide pupil, a PC IOL and Morcher rings.

**Ryc. 3B.** Badanie SL-OCT przedniego odcinka, ukazuje szeroką źrenicę, PC IOL i pierścienie Morcher.

## Discussion

The iris defects may be congenital or acquired and may differ in size and location.

There are many known congenital iris defects, e.g. iris coloboma, iridocorneal dysgenesias (Rieger's anomaly, aniridia), as well as iridocorneal endothelial syndrome (ICE – a progressive iris atrophy), Cogan-Reese syndrome and Chandler's syndrome.

There are also many types acquired iris defects as well, with the most common being: inflammatory defects (e.g. secondary iris atrophy after anterior uveitis), traumatic defects (e.g. iridodialysis after a blunt trauma or iris extrusion through the wound after a penetrating trauma), glaucoma-related defects (iridoschisis in the elderly), postoperative defects (a large iridectomy, iris trauma caused by aspirating the iris tissue by the phaco tip during phacoemulsification, atonic pupil after intraocular surgery or lack of iris tissue after an intraocular tumor resection) (1, 2).

Small defects of the iris tissue may be asymptomatic and may not require any treatment, however, large defects, aniridia or a very wide atonic pupil, the absence of normally functioning pupil causes significant light reflexes, increases optical aberrations and may cause glare or even monocular diplopia. In such cases, it is advisable to reconstruct the iris and the pupil, which increases the quality of the perceived image (2).

There are several available treatment methods. Direct suturing of the iris defect with a single McCannel suture is a good solution in cases of irregular iris defect (e.g. in coloboma). A small iris defect can also be repaired using Siepser sliding suture technique – a suturing technique where the knot is created outside the eye and then it slides inside after the two suture ends are pulled in the opposite directions (3).

In the presented case the entire iris was preserved and no part was missing, the pupil was regular, dilated and atonic. In such cases, where permanent mydriasis is caused by iris sphincter damage and no part of the iris is missing, an iris cerclage running polypropylene suture technique has been described (4). Using the technique, a precisely sized and relatively round (although sometimes irregular) pupil shape can be created.

Another possible solution is to use an intraocular lens with an in-built iris prosthesis (a black diaphragm intraocular lens) (5, 6). These lenses are appropriate for traumatic aniridia, where the iris defect is large and there is no capsular support. They require pars plana vitrectomy, a large corneal incision (11–12 mm wide) and they are sutured to the sclera. Therefore, the surgery is complex and the risk of complications is higher than the risk associated with cataract surgery. In our case there was no traumatic aniridia, the lens was intact and the capsule was preserved. Therefore, the described approach was unnecessary in this case and a less complex surgery was chosen.

It would also have been possible to use an iris prosthesis. There are authors, who published good outcomes of using such devices.

Magnus et al. (7) used an iris prosthesis produced by Dr. Schmidt Intraocularlinsen GmbH (Germany) in a patient with a traumatic, partial iris defect. The iris prosthesis is made of a biocompatible, flexible silicone and may be adjusted to the individual colour of the iris. The authors observed no complications and cosmetic result was excellent. The patients reported the decrease of glare and photophobia after

surgery. The only drawback of this method is the high cost of the silicone iris prosthesis.

In our case another solution was chosen, namely – black Morcher capsular rings. These are rigid black single-piece PEMA rings manufactured by Morcher, which come in different sizes. They are implanted in the bag, with forceps, through the main incision and do not require creating any additional incisions, widening the existing incision, or suturing. In our case, the capsule was preserved, so this method seemed to be the preferred choice. The surgery was not complex, the insertion and rotation of the rings was quick and easy, and could be performed during routine phacoemulsification, through a 2.75 mm incision, under topical anaesthesia. The only disadvantage was the black color of the rings, which does not match the color of the iris, however, the patient was happy with this solution.

Osher et al. (8) found capsular ring implantation to be a safe and effective treatment method. They described 6 cases with iris defects and emphasized the advantage of implanting the rings during phacoemulsification through a small incision – the same main incision which was used for phacoemulsification and a foldable IOL implantation.

Ayliffe et al. (9) confirmed that capsular ring implantation is safe in eyes with concomitant iris defect and cataract. The rings were stable and did not dislocate during the two-year follow-up period.

All the above-mentioned methods offer good functional outcomes, good cosmetic outcomes, decrease aberrations of the optical system of the eye and eliminate unwanted photopic phenomena (e.g. glare).

Nevertheless, the complexity of surgery differs and so does the spectrum of possible iris defects and concomitant ocular diseases. Therefore, in order to maximize the safety of the procedure and to reduce the risk of possible complications, it is important to choose the approach based on the assessment of the individual case and the surgeon's experience.

To the best of our knowledge, this is the first case of implanting Morcher aniridia capsular rings during phacoemulsification in an eye with atonic pupil due to previous iridencleisis.

## Conclusion

The presented case indicates that Morcher aniridia capsular rings may be a good instrument to device which assists

the surgeon in cases of cataract concomitant with dilated, atonic pupil. Using these rings reduces glare and improves the subjective quality of patients' vision.

## Financial Disclosure

**Authors confirm that they do not have any commercial or proprietary interest in any product or company mentioned. Authors confirm no financial support.**

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