

# A New Technique of Congenital Partial Iris Coloboma Repair

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## Abstract

*Description of a technique of repair congenital, partial coloboma, which allows to avoid followed shifting of the pupil toward repair place. A respective cut of the basis of iris gives possibility to close coloboma and protect against described decentration. This technique has been used in phakic and pseudophakic eyes. Altogether, 5 patients have been treated using this new method in the last 4 years.*

**Keywords:** congenital iris coloboma, iris repair surgery

## INTRODUCTION

The word coloboma comes from the Greek, in which koloboma means 'maimed, damaged'<sup>1</sup>. Defect is observed very rarely, ie, among 0.5-2.2 people out of 10000. Coloboma is a growth eyeball defect, occurring in the 5th-6th week of fetal life<sup>2,3</sup>. It is created as a result of an incomplete closure of the germinal coloboma. If it is associated with a defect along its entire length, then we are dealing with a complete coloboma. Partial deficit involves only some eye structures: iris, ciliary body, retina, choroid or optic nerve disk. The defect is based on changes in the chromosomal system. Coloboma can have autosomal dominant or as autosomal recessive pattern of inheritance, however isolated cases are also seen.<sup>4,5</sup> The most common location of the defect is the lower or nasal-lower part of the iris. The pupil with the defect takes on an oval shape or resembles as a keyhole, through which the edge of the lens and the Zinn's zonule can be seen<sup>5</sup>. An acquired coloboma may arise as a result of an injury, including also a surgical injury, and in addition it can appear as a consequence of ciliary muscle paralysis (cycloplegia).

## TREATMENT

Among the methods of the treatment of coloboma we can distinguish non-surgical and surgical methods. When we treat it conservatively, we mainly use a headgear such as hat or cap or prosthetic contact lenses. Iris surgery involves the use of partial aniridial rings or lenses (aniridia – lack of iris) and iris repair

surgery. During making a decision about the treatment method, we should consider many factors, including the patient's expectations and the possibilities of their fulfillment, which result depends on the extent of damage of the eye structures. Most patients with iris defect wants to remove cosmetic defect of the eye only. They do not realize that an ophthalmologist by carrying out an appropriate medical procedure can get not only cosmetic effect but also improve visual acuity. An improvement of vision is not possible when coloboma involves macular area.

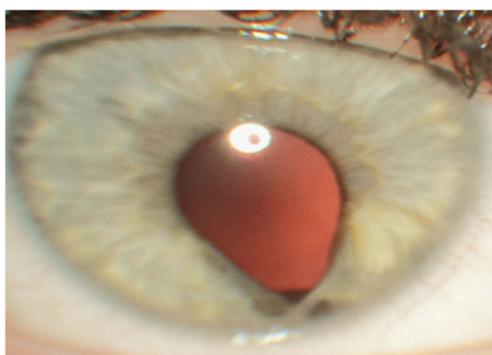
We should not forget about correction of refractive errors, which often accompanies this abnormality. If the defect is small, vision may be correct. If coloboma is obscured by the eyelid, and no unfavourable consequences of its presence, there is no need for treatment. Larger defects of the iris can cause deterioration of visual acuity, photophobia, and monocular diplopia<sup>3-5</sup>. In such cases a prosthetic contact lens can be used to cover iris defect. These are made of a material that gives the effect of an opacity substrate. The use of prosthetic lenses often allows to achieve both effects, cosmetic and improvement of visual acuity<sup>6</sup>. Surgical treatment is based mainly on implantation of aniridia lenses and rings, which are designed for correction partial or total iris defects. Using of such implants requires removal of patient's lens before. We should remember that eyes with the presence of congenital defect of the choroid are more likely to have complications during cataract removal. Abnormal development of the

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sclera, choroid and lens ligaments make the surgical treatment more risky with consecutive vitreous prolapse during cataract (or clear lens) extraction. Additionally some patients can develop monocular diplopia from the exposure of intraocular lens edge after artificial lens implantation<sup>7</sup>. Suturing of iris coloboma eliminates this problem. Siepser and Chang have described the technique of applying stitches on the iris using a sliding knot (slip-knot-technique)<sup>8,9</sup>. The advantage of this method is the lower risk of damage of the internal structure of the eye, because all the maneuvers are performed outside the eyeball. Thanks to that technique we can have significant better stability of the anterior chamber of the eye during the surgery<sup>8,9</sup>. Many modifications of this procedure have been proposed, and, in combination with new microinstruments we can significantly improve and facilitate the repair of the iris defect<sup>9-11</sup>. One of the modifications proposes to cut the iris sphincter on both sides of the defect. Next the edges are connected and defect is closed using 10-0 polypropylene stitches. The remaining paralimbal defect is closed in the same way to avoid relocating of the pupil toward iris coloboma, which can occur during contraction of the iris sphincter muscle. This modified technique allows to keep the pupil in central location and to get its round shape<sup>12</sup>.

### MATERIAL AND METHOD

Between February 2014 and June 2017, the iris repair surgery has been performed in 5 patients (5 eyes) – 2 women and 3 men. The main reason of patient's visit was to improve cosmetic appearance of the eye. In addition, 4 patients have reported vision disturbances including various intensity of photophobia. The patients' age ranged from 13 to 38 years. One person (1 eye) was pseudophakic, the other patients (4 eyes) had crystalline lens (Fig. 1).



**Fig 1.** Congenital, partial coloboma of the iris.

*Source: Silesian Eye Treatment Centre*

Congenital coloboma has been diagnosed unilaterally in all patients. The average best corrected visual acuity (BCVA) to far (logMAR) reached the value of 2.0 in 2 people (eyes). That was a consequence of the presence of the defect including macular region. Mean BCVA gained 0.2 in the remaining 3 eyes, in a range from 0.3 to 0.1, where the macula hasn't been involved (Fig. 2).



**Fig 2.** Congenital defect of choroid not reaching to the macula.

*Source: Silesian Eye Treatment Centre*

Medical examination has shown the presence of keyhole in shape loss, located in lower part of the iris. The pupil has been slightly shifted towards the center of the coloboma. It was noted that only the upper part of the iris has reacted after light exposition, where function of the iris sphincter muscle was preserved. Additionally there was a lack of anterior pigment epithelium observed within the defect, which corresponds with the place where the iris did not close. Besides to the mentioned choroidal defect which has involved the macula region in 2 people (2 eyes), no retinal pathology has been found in any of the eyes. All patients with partial iris defect have been operated on using an own modification of repair technique. Patients have been informed about the possibility of postoperative complications, including temporary bleeding into the anterior chamber and vitreous cavity, and subsequent lens opacification.

### TECHNIQUE

Stages of iris repair surgery (Fig. 3A-f):

1. Intraocular anesthesia with 1% lidocaine solution ( Fig. 3a)
2. Separation of the iris from the lens by filling anterior chamber using 1,4% viscoelastic fluid.

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3. Limbal cuts using 15G knife in 1/5 of the cornea height on both sides of the iris.
4. Grasping the margin of the iris in the area of the defect using 23G endoforceps and pulling it towards the defect and also upwards (Fig. 3b)
5. Intersection of the base of the extended iris using 23G endoscissors from the second corneal entrance on the length of 1-1.5 mm (our modification) (Fig. 3c,d)
6. While maintaining the continuous tension of undercut base of the iris, carrying a straight 10,0 needle through it (Fig. 3e).
7. Dragging the needle through the base of the second root of the undercut iris (Fig. 3e).
8. Closing-up the edges of the cut iris root and looping the thread using a slip-knot technique.
9. Putting on 2-3 stitches in place of the iris defect ends the iris repair surgery (Fig.3f-h).
10. In each case, in order to protect the crystalline lens from direct needle injury, a safety maneuver using the 27G cannula ( our modification) was additionally applied. The idea of the maneuver is to insert the tip of the needle - directly after going through the iris - to the cannula, which further serves as a slide for the needle.

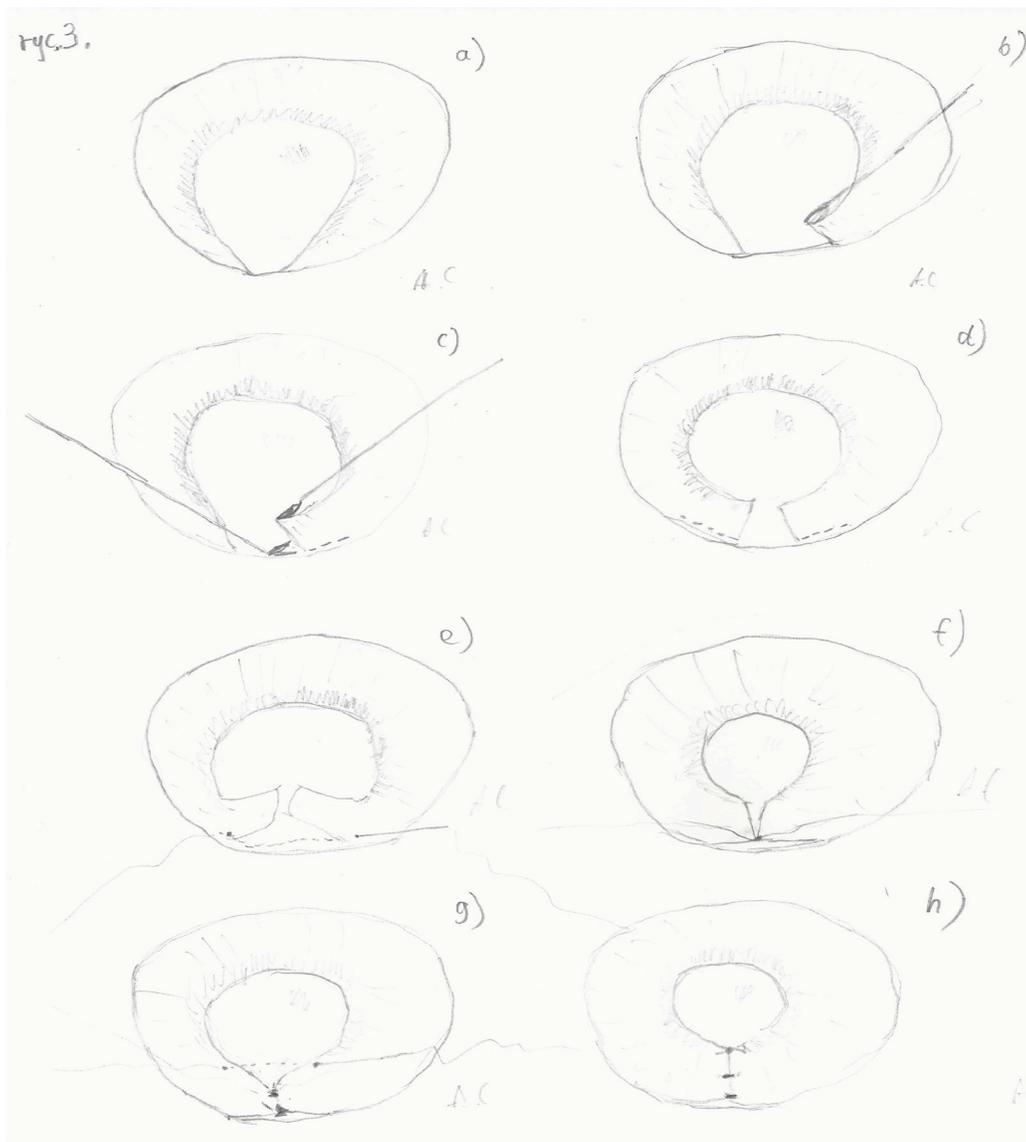
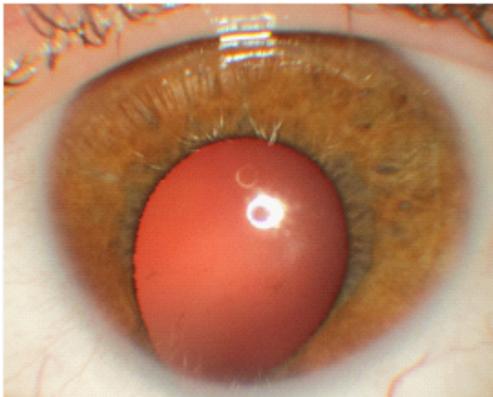


Fig 3. Scheme of iris repair surgery using our modo.

Source: Silesian Eye Treatment Centre

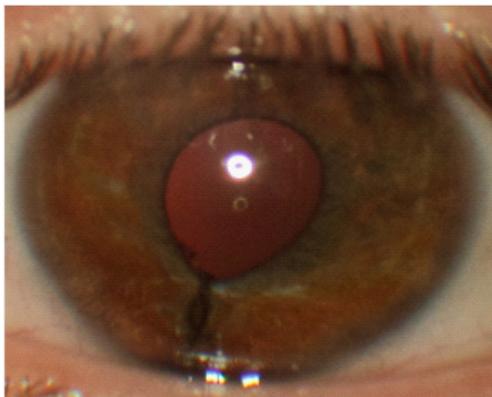
### RESULTS

The procedure was performed without complications in all patients. Apart from intraoperative bleeding into the anterior chamber - appeared in most cases, and also bleeding into the vitreous body chamber lasting several days in one person, no additional postoperative complications have been observed. The crystalline lens haven't been damaged during this surgery. What is the most important, the procedure did not cause postoperative shifting of the pupil towards the cavity due to our modification. The visual acuity has not been deteriorated. In addition to removing the pupil defect, the vision quality has been additionally improved, mainly due to the withdrawal of the photophobia (Fig. 4A,b)



**Fig 4a.** Congenital partial iris coloboma before the repair surgery.

Source: Silesian Eye Treatment Centre



**Fig 4b.** Same eye after the repair surgery.

Source: Silesian Eye Treatment Centre

### DISCUSSION

Most techniques of repair partial congenital coloboma, by simple applying the stitches directly to the iris loss, can get an effect of its closing. They haven't allowed to

avoid shifting the pupil towards treated place, so, using such techniques we can expect deterioration of visual acuity. Using our modification we can avoid this effect. Why do authors think that it is possible to pull the margins of the iris in such a range without increasing the number of complications (tear, haemorrhage)?

Taking into account a reason of development of congenital iris coloboma we can suppose that we have only lack of the adhesion of its margins. This means that there is an excess of iris tissue, which, have only been partially obstructed. Therefore, its mechanical pulling and stretching does not involve the occurrence of the disadvantages described above.

### CONCLUSIONS

A technique of repair partial iris loss with using our modification, applied in the treatment of congenital iris coloboma, allows to close iris loss without post-surgical displacement of the pupil towards treated place. It protects against postsurgical deterioration of vision.

#### What was Known

- Pupil shifting towards treated place of the iris is usually observed when the stitches are simply placed on the iris without any additional maneuvers. It can cause deterioration of visual acuity.
- Crystalline lens is removed prior to iris plastic surgery

#### What this Paper Adds

- By using the maneuver, described in our paper we can avoid shifting of the pupil and followed deterioration visual acuity<sup>11,12</sup>.
- We don't need to remove crystalline lens prior to making surgical repair of congenital partial iris coloboma.

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