REFRACTIVE SURGERY IN A PATIENT WITH ALPORT SYNDROME. A CASE REPORT

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SUMMARY

The authors present a case of a thirty-eight-year-old patient with Alport syndrome. The patient had several ocular symptoms of the disease and has been treated for systemic problems in connection with Alport syndrome since he was fifteen years old. At that age the patient also underwent a kidney transplant in order to deal with renal insufficiency. To date, he still uses immunosuppressants and antihypertensives. Furthermore, the patient suffers from perceptive deafness. The patient visited our clinic in 2021 with a request to solve his high refractive error, in which the diopters were so high that it was not possible to place them in spectacles. The patient's best corrected visual acuity was 0.6 with -8.0sph/-4.0cyl/ax15 in the right eye and 0.7partim with -8.0sph/-4.0cyl/ax155 in the left eye. The autorefractometer values were -6.25sph/-6.75cyl/ax17 in the right eye and -6.75sph/-6.5cyl/ax155 in the left eye. During the eye examination we found a number of ocular manifestations that are typical of Alport syndrome. On the cornea there were opacities as a residue of corneal erosions, and at one of the following check-ups we also found a newly developed corneal erosion. Subsequently, we found an anterior lenticonus and incipient cataract. Upon performing OCT, a typical temporal macular atrophy was evident. Fundus examination in artificial mydriasis showed just a minimal manifestation of fleck retinopathy. Due to the clinical manifestation we decided to perform cataract surgery and implant a monofocal toric intraocular lens in both eyes. There were no complications during the operations, however the surgeon registered a non-standard structure of the lens capsule. The capsule was more fragile, and performing capsulorhexis was much more complicated. A week after the surgery, higher cylinder diopters were still present. A decrease of the higher diopters was noticeable one month after surgery. The time interval between the first operation and the second operation was one month. The patient was highly satisfied with result, and uncorrected visual acuity improved by over four lines. After surgery the patient needed low diopters for near as well as far distance. In the case of this patient, the ocular manifestations were detected and treated in adulthood. Nevertheless, early detection of ocular symptoms of Alport syndrome in young patients before renal failure could lead to timely start of the treatment and delay a possible renal transplant. In case of any suspicion of Alport syndrome it is advised to send the patient to a pediatrician, and at an older age to an internal medicine specialist, for further examination.

Key words: Alport syndrome, lenticonus, cataract

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INTRODUCTION

Alport syndrome (AS) is a progressive hereditary disease with variable heredity and phenotype heterogeneity. Mutation is present in genes for α chains of type IV collagen, which is a part of the basement membrane of the renal glomeruli, the inner ear and certain parts of the eye.

Damage to the structure and function of these tissues takes place, with a subsequent onset of typical symptoms [1,2]. One of the most common and earliest symptoms is hematuria. Sensorineural (perceptive) hearing loss appears in late childhood [3,4]. The main ocular symptoms we find in AS are anterior lenticonus, central and peripheral fleck retinopathy [5,6]. Other symptoms, which are not so usual, but we can find them in AS are corneal opacity following repeated erosions, posterior polymorphous corneal dy-strophy, cataract, posterior lenticonus, temporal atrophy of the macular landscape, and macular hole [6]. Whereas changes on the cornea or lens often deteriorate vision, changes on the retina generally do not have an impact on visual acuity [7]. An ocular finding is not essential for determination of a diagnosis of AS, but it may aid in timely diagnosis and also treatment, which may bring about stalling of renal failure [5]. The internal determination of this pathology consists

in a physical examination, medical history, including of the family, urine analysis, and examination of renal biopsy [8]. Upon confirmation of AS, the patient should be referred to further specialists such as an otorhinolaryngologist and an ophthalmologist. Genetic testing helps not only with determination of the diagnosis, but also in determining heredity in the individual in question and detecting AS also in the patient's family members [4].

A CASE REPORT

In 2021 a 38-year-old male patient reported to our clinic with a request for the solution of a high refractive error, which was practically impossible to correct with the use of glasses or contact lenses. The patient stated subjective deterioration of distance vision in the last few years, during which it had also been necessary to adjust his glasses correction several times. The patient has worn glasses for distance vision since the age of 15 years. According to the patient's statement, until the age of 30 he wore glasses correction of approximately -3.0sphD, and in the following years this value progressively increased. In addition, from his ocular medical history he described repeated corneal erosion, which he mostly treated himself at home using lubricants. From his personal medical history the patient reported Alport syndrome. He had been receiving treatment for general manifestations of this pathology since the age of 15, when he also underwent a kidney transplant due to renal insufficiency. He is a long-term user of immunosuppressants and antihypertensives to this day. The patient also suffers from perceptive hearing loss. Best corrected visual acuity was 0.6 with correction of -8.0sph/-4.0cyl/ax15 in the right eye and 0.7partim with correction of -8.0sph/-4.0cyl/ax155 in the left eye, in which the values corresponded to the patient's own correction. The values on autorefractor were -6.25sph/-6.75cyl/ax17 in the right eye and -6.75sph/-6.5cyl/ax155 in the left eye. Intraocular pressure was normal. Upon examination on a slit lamp, we described local opacity on the cornea, which was probably a location where repeated erosions had occurred (Figure 1). The anterior chamber, pupil and iris were within the norm. In artificial mydriasis the anterior surface of the lens was unusually conically bulging in its central region, therefore bilateral anterior lenticonus of the lens was present, which we also displayed on anterior chamber optical coherence tomography (Figure 2). Incipient, predominantly nuclear cataract was present. The vitreous was within the norm. On the ocular fundus, the optic nerve papilla was within the norm. On the retina there was only a very discrete finding of whitish-yellow flecks in the macular region in both eyes, which we documented on fundus photography (Figure 3, 4). An examination was conducted by optical coherence to-

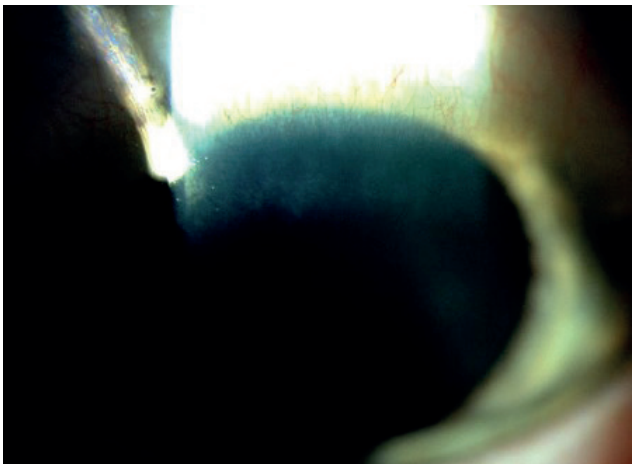

Figure 1. Corneal opacity of the right eye, resulting from the recurrent corneal erosions

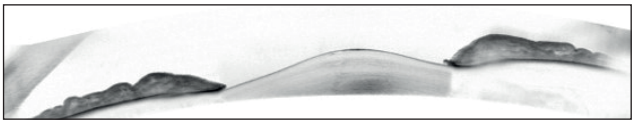

Figure 2. Anterior lenticonus of the right eye

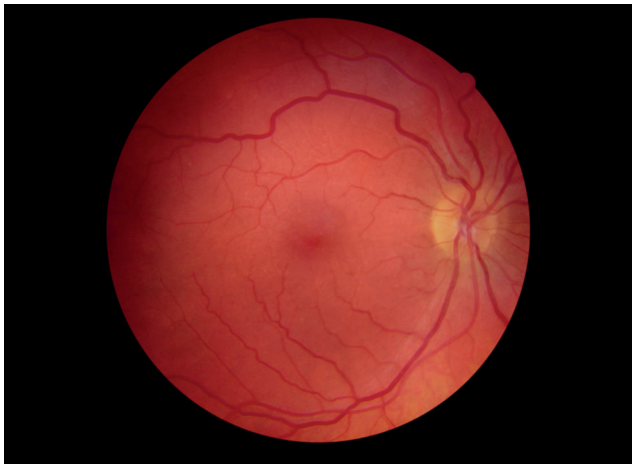

Figure 3. Fundus photo of the right eye, depicting the central and peripheral discreet dot-and-fleck retinopathy

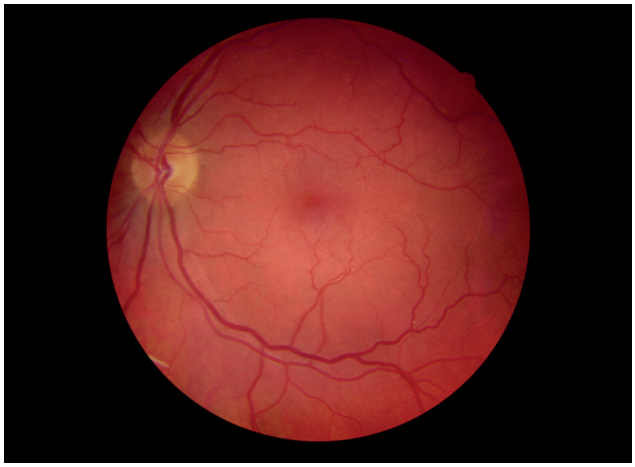

Figure 4. Fundus photo of the left eye with the similar findings as on the right eye

mography, in which atrophy of the temporal part of the macula was evident in both eyes (Figure 5, 6). Pentacam showed with-the-rule astigmatism of size of 3.4cylD in both eyes, pachymetry was normal (Figure 7, 8). Biometric parameters measured on IOL Master 700 seemed rather to indicate a hypermetropia. However, this was negated by the presence of anterior lenticonus of the lens, which led to progressive myopia and higher astigmatism than was indicated according to Pentacam. Paradoxically, the length of the eye was 21.52 mm in the right eye and 21.66 mm in the left eye, the depth of the anterior chamber was 2.59 mm in the right eye and 2.58 mm in the left eye. Surgery for incipient cataract was proposed, with the implantation of a toric monofocal lens in both eyes. The IOL power calculation was calculated so as to ensure that the resulting refraction was -2.0sphD, thus retaining glasses for distance vision according to the patient's wishes. The procedure itself was without complications, nevertheless the surgeon drew attention to the unusual fragility and thinness of the anterior lens capsule.

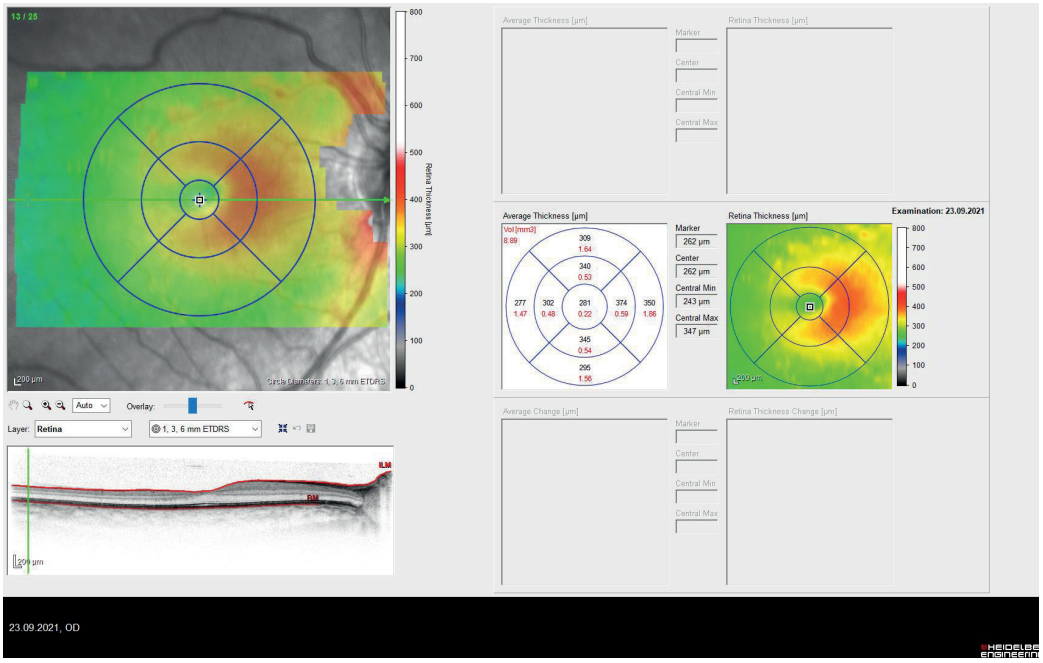

Figure 5. OCT picture of the right eye with the evident retinal thinning in temporal part of the macula

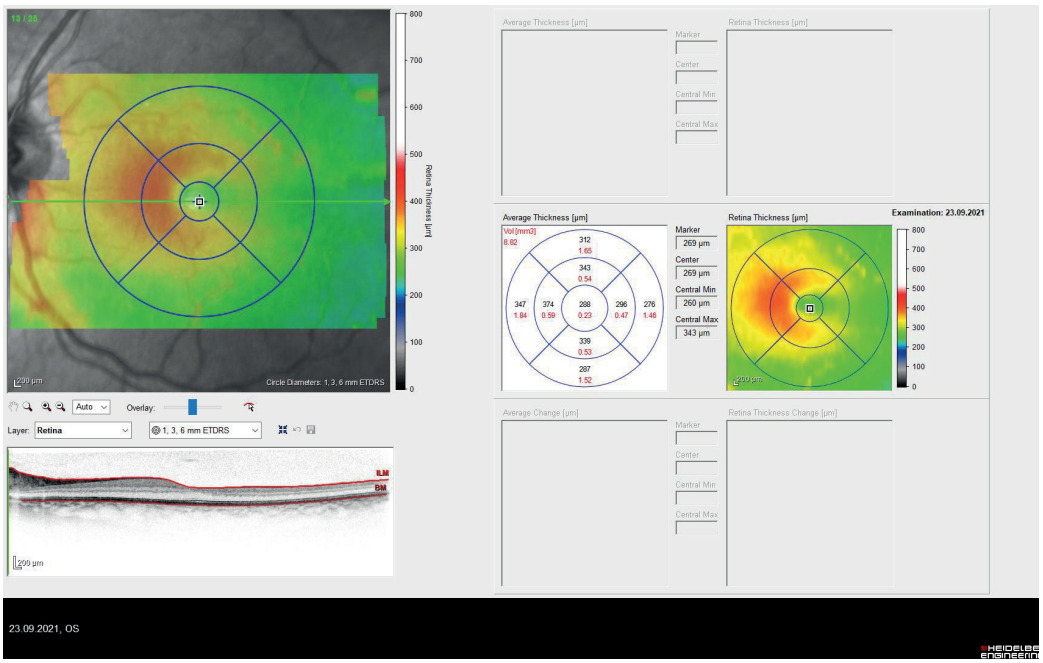

Figure 6. OCT picture of the left eye with the evident retinal thinning in temporal part of the macula

A monofocal toric IOL with the size of +29.0sph/4.25cyl/ax65 was implanted in the left eye, and with a size of +29.0sph/3.5cyl/ax110 in the right eye.

Following the first operation on the left eye, after an interval of two days it was necessary to perform additional rotation of the IOL to the planned axis of 65 degrees, since a shift of 10 degrees had occurred. Postoperatively the patient underwent standard therapy with tobramycin/dexamethasone gtt 5x per day for one week, and then 3x per day for another week. During the postoperative follow-ups it took several weeks before a decrease of the residual cylindrical diopters took place. The patient's natural vision after surgery was 0.5partim in the right eye and 0.2 in the left eye. Near

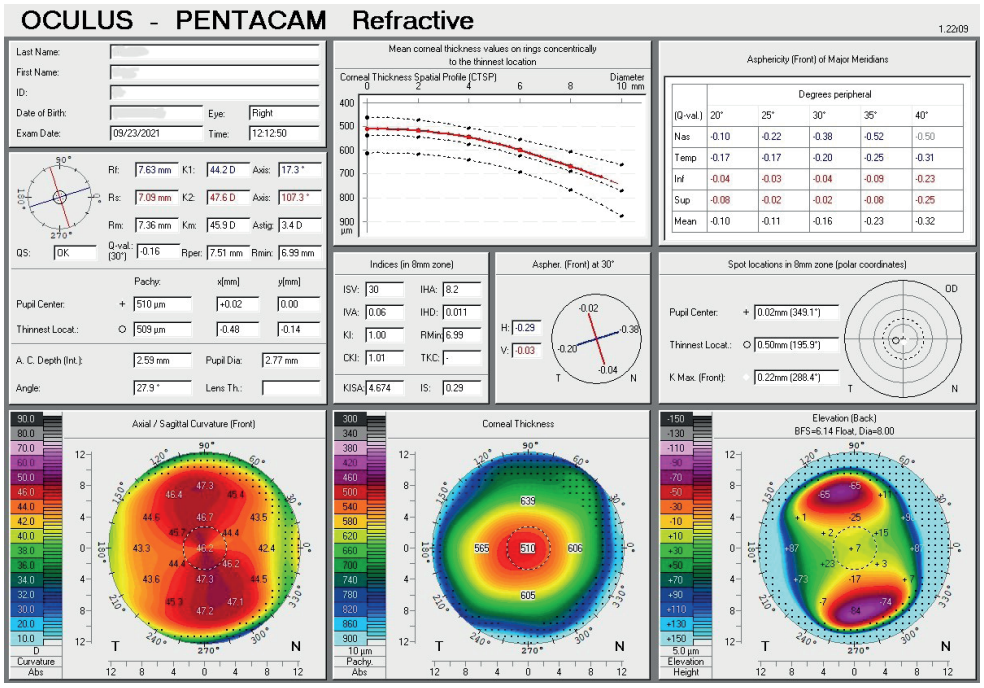

Figure 7. Pentacam of the right eye, depicting with-the-rule astigmatism

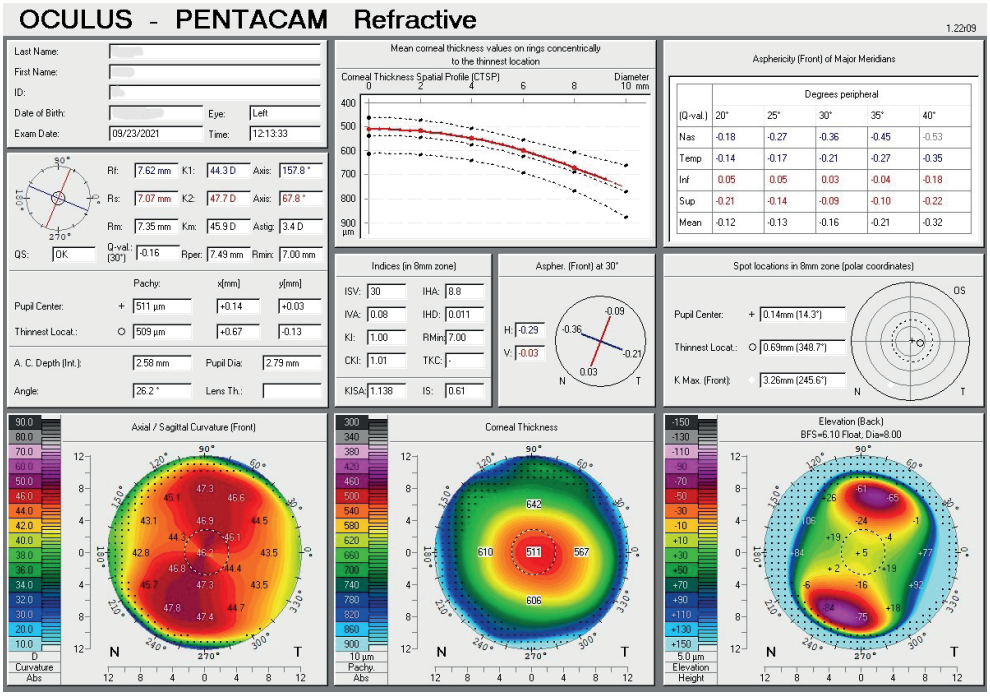

Figure 8. Pentacam of the left eye, depicting with-the-rule astigmatism

vision was 0.5 and 0.63 naturally. The patient's resulting refraction was -0.75sph/-1.0cyl/ax172 in the right eye and -1.50sph/-0.75cyl/ax13 in the left eye. Best corrected distance visual acuity was 1.0 in both eyes. The patient was satisfied with the result of the operation and continues to attend our follow-up examinations. At a follow-up one year after the procedure we determined that the patient's vision had not deteriorated and that there had been no progression of the finding on the retina.

DISCUSSION

Alport syndrome is a progressive hereditary disease, which affects one person in 5000 [1]. Heredity is most commonly X-linked, constituting as many as approximately 80% of cases, less common are autosomal recessive and also autosomal dominant heredity. Men are affected with AS more frequently than women. The individual genes in which mutation takes place are COL4A3, COL4A4 in autosomal dominant and autosomal recessive heredity, and COL4A5 in X-linked heredity [1,2]. Because AS also entails damage to the basal membrane of the lens capsule, the Descemet's membrane, the Bowman's membrane, the internal limiting membrane of the retina and the basal membrane of the retinal pigment epithelium, ocular symptoms are also present [6,9,10]. The main ocular symptoms we find in AS are anterior lenticonus, and central and peripheral fleck retinopathy [5,6]. Whereas changes to the cornea or lens often deteriorate vision, changes on the retina generally do not have an impact on visual acuity [7]. Lenticonus is a morphological ocular pathology, in which thinning of the lens capsule leads to its conical protrusion, with the result of refractive changes in the sense of progressive myopia and irregular astigmatism. Upon examination on a slit lamp, we can observe the symptom of an oil droplet, which is located axially. The incidence of lenticonus is more commonly anterior, but may also be posterior [6]. The replacement of a morphologically altered clear lens (or a lens with cataract) with an artificial lens is an effective way of correcting the patient's refractive error and improving visual acuity [11]. In comparison with senile cataract surgery, operation of a lens with anterior lenticonus is technically more demanding due to the greater fragility and thinning of the anterior lens capsule [12]. According to the described histological findings upon examination of the anterior capsule by electron microscope, an abnormal structure was observed. The examination revealed thinning of the anterior capsule not only in its central part, where conical bulging is manifested, but also in its periphery. Vertical dehiscence was evident in the inner two thirds of the capsule, as well as irregularity of the lens epithelium, and the epithelial cells themselves also manifested pathological changes [13,14]. The main differences we have in the case of cataract surgery in AS, in contrast with regular senile cataract surgery, are the non-standard structure of the anterior capsule, the approach to calculation of the IOL, in which it is necessary also to take corneal topography as a basis when selecting the cylindrical value and axis of astigmatism, and finally, after consultation with the patient, to consider implantation of a toric either monofocal or multifocal lens [12]. In the case of our patient, on the basis of a biometric measurement we chose a toric monofocal lens with a target refraction of -2.0sph. The patient was accustomed to wearing glasses correction since puberty, and wished to retain them. It ensues from a number of studies that in the case of cataract surgery with the assistance of a femtosecond laser, the risk of complications is reduced upon performance of capsulorhexis, in which the fragility of the anterior capsule may result in an unwanted spread to the periphery and an irregular shape [11,12,15]. From the experience of other authors, when capsulorhexis is performed in the standard manner, it is recommended to use micro-forceps due to the greater technical demands placed by this part of the operation in order to prevent spread to the periphery [16]. During the operations on our patient, manual capsulorhexis was performed with the use of regular instruments, and took place without complications. Of the pathologies of the posterior segment of the eye, the most common is fleck retinopathy, which is manifested in whitish and yellowish dots and flecks. Upon a view of the ocular fundus, it is sometimes possible to distinguish "lozenge" sign or a dull macula reflex, which is generated by reduction of the thickness of the temporal region of the macula. These changes take place upon a background of thinning of the internal limiting membrane, of the retinal nerve fiber layer and the basal membrane of the RPE [9]. Central or peripheral retinopathy is most frequently present from the patient's adolescent years [8]. A retinal complication which may occur in very rare cases and can have a markedly deteriorating effect on vision is macular hole. The size is usually larger than in the case of macular hole due to other causes, and the postoperative results are generally not good [6,7,9,17]. Fortunately, in the case of our patient this pathology was not present, and so surgery on the posterior segment of the eye was not required. Ocular symptoms are not necessary for determination of a diagnosis of AS. However, in the case of suspicion of this pathology and referral to an internal medicine specialist, these symptoms may aid in timely diagnosis and treatment [5].

CONCLUSION

If we are able to determine typical ocular pathologies of AS at an ophthalmological examination and subsequently refer a patient with suspicion of AS to an internal medicine specialist who can administer the required treatment in a timely manner, this can aid us in stalling the possibility of renal failure and subsequent kidney transplantation for the patient. In addition, as ophthalmologists we have an opportunity to improve the pati-

ent's visual acuity by means of surgery on the morphologically altered clear lens, by replacing it with an artificial lens. However, careful preoperative planning and an experienced surgeon are required in order to ensure that the postoperative result is as satisfactory as possible. It is also necessary to consider examination of the remaining members of the family for the potential occurrence of this pathology also in these individuals.

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