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Case Report

Creating Hybrid Monovision with 7.0 mm XL Optic and High-Add AMD Intraocular Lenses (XL-MAGS) in a Patient with Retinitis Pigmentosa

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Keywords
Retinitis pigmentosa · XL optic · ASPIRA-aXA · Hybrid monovision · High-add intraocular lens · MAGS Magnifying Surgery

Abstract
We report a case of a patient with progressed retinitis pigmentosa (RP) who underwent bilateral cataract extraction with implantation of a monofocal enlarged optic in the far dominant eye and a high-add AMD intraocular lens (IOL) in the near dominant eye (hybrid monovision XL-MAGS). A 71-year-old woman presented to our clinic complaining of reduced visual acuity additionally to her diagnosis of RP. The high-add IOL LENTIS® MAX LS-313 MF80 (Oculentis, Germany) was implanted in the right eye and the 7.0 mm optic ASPIRA-aXA IOL (HumanOptics, Germany) in the left eye. Six months postoperatively, the uncorrected distance visual acuity improved from hand motion to 0.5 logMAR in the right eye and to 0.3 logMAR in the left eye. Similarly, best corrected near visual acuity significantly improved to 0.4 and 0.7 logMAR, respectively. The patient's subjective quality of life and autonomy improved significantly. RP is a severe retinal disease which leads to loss of vision and typical "tunnel vision" with visual field

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defects. As this genetic disorder is incurable, many ophthalmologists are not willing to perform cataract surgery. However, this case report shows that creating hybrid monovision with a high-add lens and a 7.0 mm optic IOL led to improvement of visual function and, more importantly, enhanced quality of life and self-autonomy of the patient.

Introduction

Retinitis pigmentosa (RP) belongs to the group of hereditary retinal degenerative diseases and comprises all retinal dystrophies concomitant with a loss of photoreceptors and retinal pigment deposits. Another description of RP is rod-cone dystrophy with rods being more affected than cones, which leads to night blindness as the earliest symptom, and decrease of contrast sensitivity and ability to light adaptation [1]. Later in life, peripheral vision and ultimately central vision are affected by the progressive loss of photoreceptor cells, leading to distinctive visual field loss ("tunnel view"). The altered visual performance can somewhat be improved by low vision aids [2] such as magnification lenses. However, RP is known to be concomitant with complications like cystoid macular edema, epiretinal membrane, and the development of cataract at relatively young age [3]. Therefore, early cataract surgery is recommended in patients with RP, which has been proven to be beneficial for most patients [4, 5]. Nonetheless, RP eyes are also particularly prone to postoperative complications, with several reports showing a relationship between RP and intraocular lens (IOL) dislocation following severe capsule contraction [6, 7] and rapid capsular phimosis, likely due to zonular dehiscence or increased lens epithelial cell fibrosis [8]. Thus, a large capsulorhexis size would be helpful in preventing the occurrence of anterior capsular contraction [9–11]. More precisely, Joo and colleagues [10] have recommended capsulorhexis sizes of 6.0 mm or larger in RP patients who undergo cataract surgery. However, since most available IOLs have an optic diameter of 6.0 mm, the targeted overlap would then be minimal or nonexistent, thereby increasing the risk of IOL tilt, decentration, posterior and anterior capsular opacification, and other disturbances [12]. We herein present the first report of hybrid monovision in a RP patient achieved by implanting a combination of a 7.0 mm optic diameter IOL, the ASPIRA-aXA (HumanOptics AG, Erlangen, Germany), and a high-add AMD lens, the LENTIS® MAX LS-313 MF80 (Oculentis GmbH, Berlin, Germany).

Case Report/Case Presentation

A 71-year-old female patient, diagnosed with RP more than 30 years ago, presented at our clinic for a second opinion because her visual acuity (VA) had significantly decreased over time to hand motion (distance 1 m) in both eyes (Fig. 1). A review of her medical records showed that about 5 years prior to this consultation, her corrected distance VA (CDVA) was 0.4 logMAR in the right eye and 0.5 logMAR in the left eye. However, visual field measurements over the last 20 years revealed slow progressing loss of the peripheral vision with reduced overall sensitivity. Upon examination in our clinic, it appeared that the patient had brunescent mature senile cataracts, preventing further visual field tests. Intraocular pressure

measurement was within acceptable limits, with values of 18–20 mm Hg in both eyes without any therapy.

Together we decided upon bilateral extraction of the cataract to improve VA. We performed a standard phacoemulsification procedure with implantation of a new high-add AMD lens (LENTIS® MAX LS-313 MF80, Oculentis, Germany) in the right, near dominant eye and, 2 weeks later, with implantation of a monofocal, 7.0 mm optic IOL (ASPIRA-aXA, HumanOptics, Germany) in the left, far dominant eye. In the latter, an enhanced capsulorhexis of 6.5 mm was created, which has been shown to be beneficial in RP eyes [10]. Despite identifying weak zonules, both surgeries with implantation of capsular tension rings were uneventful. We observed that the enlarged optic IOL enables better view of the fundus and a best possible visual field in combination with a wider capsulorhexis, whereas the magnifying IOL enables a 3× magnification at 15 cm distance [11] (Fig. 2).

There were no postoperative complications. Patient's satisfaction was high and subjective improvement was reported immediately after surgery. VA increased significantly over time (Table 1). One week postoperatively, uncorrected distance VA was 1.0 and 0.7 logMAR in the right and left eye, respectively, and further improved to 0.7 and 0.5 logMAR 4 months after surgery. Subjective refraction was OD –0.5/+0.5 × 100 and OS –0.75/+0.5 × 90, resulting in a binocular CDVA of 0.3 logMAR. With a near addition of +1.0 dpt and +3.0 dpt, the patient's corrected near VA (CNVA) at 40.0 cm improved to 0.4 and 0.7 logMAR in the right and left eyes, respectively, leading to binocular CNVA of 0.5 logMAR. The slit-lamp examination showed no changes to preoperative results. Six months after the surgeries, CDVA was 0.5 logMAR in the right eye and 0.3 logMAR in the left eye. For near vision (CNVA), it was 0.4 and 0.7 logMAR in the right and left eye, which led to binocular VA of 0.4 logMAR. The patient did not wear distance glasses as there was no subjective improvement in VA. Nonetheless, near addition of +1.75 dpt was necessary in both eyes. The patient preferred the same slight add power for near distance in the reading glasses and was able to vary the distance to the object (e.g., book) between 30–45 cm. Intraocular pressure remained with values of 16 and 15 mm Hg, respectively. Slit-lamp examination revealed clear IOLs in situ without any further findings other than RP, which remained stable as visualized with optical coherence tomography (OCT) and fundoscopy 1 year after surgery.

Discussion/Conclusion

The new foldable one-piece 7.0 mm optic ASPIRA-aXA IOL is made of hydrophilic acrylic (water content 26%) with UV absorber and has a 360-degree sharp square edge to prevent posterior capsule opacification (PCO). Its new features are the enlarged optic, an overall diameter of 11.0 mm, and the special cut-out haptic design, which is intended to provide high stability and predictable refractive outcomes. The enlarged optic offers various applications from cataract surgery to combined phaco-vitrectomy procedures. The one-piece high-add IOL LENTIS® MAX LS-313 MF80 is made of a hydrophilic acrylate with a hydrophobic surface (water content 25%) and has a UV absorber and 360-degree square edge technology. Its overall diameter is 11.0 mm with an optic diameter of 6.0 mm. The new feature of this "high-add" IOL is a second additional near segment on the posterior surface of the lens. The sectorial bifocal acrylic lens has an aspheric biconvex design with an add power of 8.0 dpt, equating to 6.0 dpt

at the spectacle plane. Therefore, the lens enables 1.5× magnification at a distance of 30 cm and a 3× magnification at 15 cm. At the beginning, the procedure was described as "MAGS" – Magnifying Surgery [11].

To our knowledge, this is the first case describing a hybrid monovision with implantation of these two new IOLs. We found that this lens combination could significantly restore VA from hand motion to binocular CDVA of 0.3 logMAR and CNVA of 0.4 logMAR 6 months postoperatively, resulting in improved patient's quality of life within the limits of the disease. Patient's independence and quality of life was improved because of the slight monovision and different add power in the near distance together with new reading glasses. Moreover, we observed that the ASPIRA-aXA with its large 7.0 mm optic could offer an enlarged view of the fundus, which is particularly relevant in the presence of retinal diseases especially when the periphery is affected. The large optic, which allows a larger capsulorhexis (6.5 mm) with a good capsulorhexis-optic overlap, is particularly suitable for RP patients since they are more prone to anterior capsule contraction [4, 12, 13]. We observed a stable size of the capsulorhexis and well-centered IOLs in the postoperative course.

There were no intraoperative complications despite weak zonules, which are typically observed in RP eyes [14]. We also found that the designs of the LENTIS® MAX LS-313 MF80 and the Aspira-aXA IOLs, both with plate haptics, were stable and therefore particularly suitable for this case. The incidence of PCO has been found to be relatively high (84%) in RP patients with an occurrence within 6 months after surgery [5]. It is also reported that these rates within RP patients vary with different IOL materials [15]. However, we followed the patient for 12 months and so far, we have not observed an onset of PCO in either of the eyes.

The visibility of the inner and outer segment line in OCT imaging was found to be a good predictability parameter for the visual outcome after cataract surgery in RP patients [16]. These lines were still intact in our patient, which might have contributed to the increase in VA. Our case report, however, strengthens previous findings on increased postoperative visual function after cataract surgery in RP patients, despite the widespread belief that VA cannot be improved in these eyes. For instance, Yoshida et al. [5] found significantly improved best corrected VA from 0.76 to 0.45 logMAR in their patient cohort. Even in the absence of increased VA, cataract surgery is beneficial in RP patients as it might increase other aspects of visual function, as reported by Jackson and colleagues [4], who found functional improvement in 96% of their patients. It is crucial to inform the patient about the slow postoperative visual recovery due to neuroadaptation. Our patient, nonetheless, reported a much better quality of vision and improvement in performing daily tasks immediately after surgery, which further increased during the 6 months of follow-up. Increasing the quality of life and ultimately the self-autonomy of a patient is the best outcome a therapy or surgical procedure can achieve. It might not be a significant increase in measurable parameters such as VA, but for the patient, improving from hand motion to 0.7 or 0.5 logMAR is a huge relief in daily life. Most of those patients know that restoring their vision to VA of a healthy patient is not possible and they generally accept that they might become blind with time. Nonetheless, with new approaches, we can help keeping their vision as best as possible and for as long as possible. Some ophthalmologists still believe that cataract surgery is contraindicated in cases of RP and other retinal diseases. However, with this case, we can provide evidence that patients might benefit from current innovations such as high-add IOLs and large optic IOLs but also new combined approaches for surgery and therapy. This case report demonstrates that VA and especially

quality of life can be improved even in unpromising cases of incurable RP. Therefore, we can recommend hybrid monovision with these two novel IOLs to enhance patient autonomy and overall satisfaction. We want to emphasize the importance of patience after the surgery, as the neuroadaptation and the training of the eye movements need some time.

Statement of Ethics

The current study adhered to the tenets of the Declaration of Helsinki and all patients gave their written informed consent to publish their case. In this case report, standard procedures and devices with CE mark were used.

Disclosure Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Both authors (A.F.B., E.-M.B.) provided substantial contributions to conception and design, data acquisition, or data analysis and interpretation. They drafted the article and critically revised it for important intellectual content. They both approved the final version to be published.

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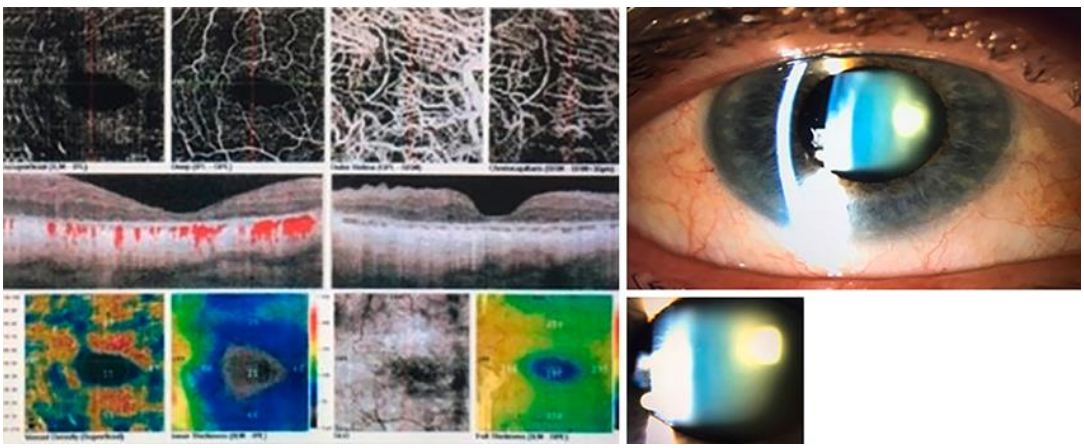

Fig. 1. Retinitis pigmentosa in the right and left eye. OCT and slit-lamp image.

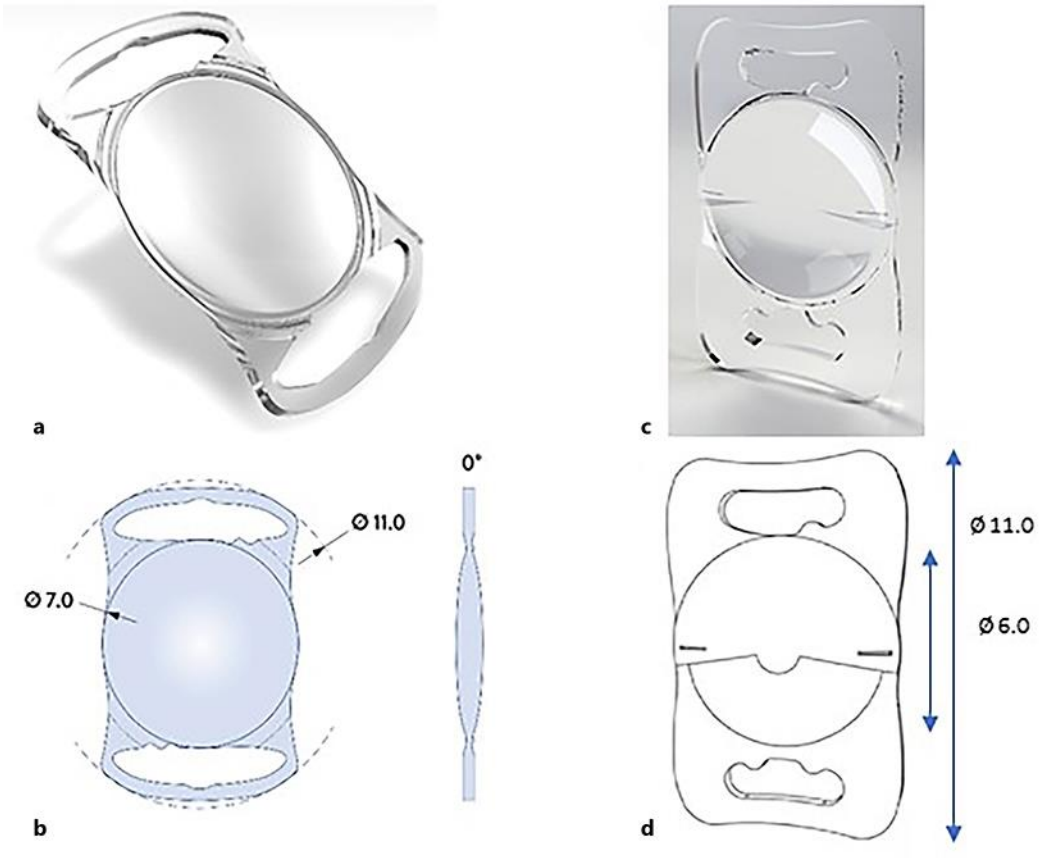

Fig. 2. **a** ASPIRA-aXA (HumanOptics). **b** Specifications of Aspira-aXA with special haptics and 360° sharp edge. **c** Lentis LS-313 MF80 (Oculentis). **d** Specifications of Lentis LS-313 MF80 with sector-shaped near vision segment and sharp edges (optic and haptic).

Table 1. Visual acuity (logMAR) improvement over time (note neuroadaptation)

	OD	OS	Binocular
Preoperatively			
CDVA	hand movements	hand movements	hand movements
1 week postoperatively			
UDVA	1.0	0.7	0.7
4 months postoperatively			
UDVA	0.7	0.5	
CDVA	0.5	0.4	0.3
UNVA	0.5	1.0	
CNVA	0.5	0.7	0.5
6 months postoperatively			
CDVA	0.5	0.3	0.3
UNVA			
CNVA	0.4	0.7	0.4
12 months postoperatively			
CDVA	0.5	0.3	0.3
UNVA			
CNVA	0.3	0.7	0.3

CDVA, corrected distance visual acuity; UDVA, uncorrected distance visual acuity; UNVA, uncorrected near visual acuity; CNVA, corrected near visual acuity.