Implantation of a double iris-claw intraocular lens in an aphakic nanophthalmic eye

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A 55-year-old female with an aphakic nanophthalmic eye underwent a secondary intraocular lens implantation (IOL) with double Artisan aphakia iris claw IOLs (ICIOLs) and was evaluated in this research. The patient's preoperative best-corrected visual acuity (BCVA) of the right eye was 0.4 (0.4 logMAR) (with + 21.00 D), postoperative 1st and 3rd month, 1st year, and 3 years BCVAs were 0.4 (0.4 logMAR). The intraocular pressure was 15 mmHg preoperatively, and 14, 12, 12, and 15 mmHg postoperatively at 1st and 3rd month, 1st year, and 3 years, respectively. The preoperative endothelial cell density (ECD) was 2372 cells/mm^2, and postoperative ECDs were 2352, 2391, 2246, and 2240 cells/mm^2 at 1st and 3rd months, at 1st year, and 3 years respectively. In aphakic nanophthalmic eyes with inadequate capsular support, which require high IOL dioptry, the implantation of double ICIOLs (one in front of the iris and the other behind the iris) seems to be safe and provides good visual rehabilitation.

Key words: Aphakia, iris claw intraocular lens, nanophthalmic eyes

Nanophthalmos is a rare, genetic disorder of the eye, in which neither anterior nor posterior segments are developed to full dimensions, without major structural abnormalities.[1] The risk of complications during intraocular surgery in these patients includes the shallowing of the anterior chamber (AC), uveal effusion, cystoid macular edema, choroidal hemorrhage, malignant glaucoma, and vitreous hemorrhage.[2] The use of an iris claw intraocular lens (ICIOL) is a good alternative to inadequate capsular support such as complicated cataract surgery, traumatic lens luxation, or severe zonulolysis.[3] Artisan/Verisyse aphakia IOLs (OPHTEC B. V./Advanced Medical Optics, Inc.,) are the new generation of iris-fixated IOLs that are anchored to the midperiphery of the iris. They have a vaulted convex-concave design and a 5.4 mm optic body, with an overall length of 8.5 mm, including the haptics. The design of the Artisan lens avoids direct contact with the iris (with the exception of the clamping sides), and this reduces the possibility of iris trauma and inflammation.[4] There is an available dioptric range (+2.0 D to +30.0 D with 1.0D increments and +14.5 D to +24.5 D with 0.5 D increments). However, it is difficult to obtain Artisan aphakia ICIOLs in high dioptric powers for aphakic nanophthalmic eyes with inadequate capsular support. Therefore, we planned the implantation of two Artisan Aphakia ICIOLs, one of them in front and the other behind the iris. To our knowledge, there are no previous reports of secondary IOL implantation of Artisan aphakia ICIOLs to anterior and posterior iris, at the same time, in an aphakic nanophthalmic eye with no capsular support.

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Case Report

A 55-year-old female with nanophthalmic aphakic complicated cataract surgery in her right eye was assessed. The surgery had taken place 1 month earlier.

The slit-lamp examination revealed aphakia, vitreous prolapse in the right eye, and cataract and a shallow AC in the left eye. Fundus appeared normal, except for papillomacular folds in both eyes.

The patient's preoperative best corrected visual acuity (BCVA) was 0.4 (0.4 logMAR) (with +21.00 D) in the right eye and 0.4 (0.4 logMAR) with +13.00 D in the left eye according to the Snellen chart, and intraocular pressure (IOP) was 15 mmHg in both eyes. We evaluated endothelial cell density (ECD) by specular microscopy (Tomey EM-3000), the axial length (AL) and IOL power calculation by Lenstar LS 900 (Haag Streit AG, Switzerland), and AC depth and corneal diameter by WaveLight ALLEGRO Oculyzer. ECD was 2372 cells/mm^2, AL was 17.30–17.60 mm, AC depth was 2.72–3.00 mm, and corneal diameter was 12.5/12.4 mm in the right and left eyes, respectively.

Accordingly, secondary IOL implantation was planned for the right eye. To meet the high diopters required, double ICIOLs were inserted. Retropupillary IOL powers were calculated using the Sanders-Retzlaff-Kraff II formula (A-constant is 116.8) as 45.50 D. To obtain 45.50 D total, a 17.5 D IOL (the manufacturer's recommendation for A constant is 115.0 for implantation above the iris) was implanted in front of the iris, and a 25 D IOL was implanted behind it.

The patient was fully informed of the details and possible risks of the procedure and a consent form was signed. All

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procedures were performed according to the ethical standards of Institutional and/or National Research Committee and in keeping with the 1964 Helsinki Declaration.

Surgical technique

Under retrobulbar anesthesia, a 5 mm superior corneal incision was made with two corneal side ports at 2 and 10 o'clock. After the anterior vitrectomy was performed, an ophthalmic viscosurgical device (1.4% Protectalon) was injected into the AC. The first IOL was inserted vertically and then rotated to the horizontal position at 3 and 9 o'clock. While holding the lens optic with lens forceps, leading haptic was pushed underneath iris, and enclavation of iris was performed using an enclavation needle. Similarly, a haptic enclavation was made on the other side of the IOL. After intracameral carbachol insertion, a second IOL was implanted using a similar method, but enclavation was performed more carefully because of first implanted IOL. The IOL in front of the iris was implanted 1 h clockwise (2 and 8 o'clock) from the IOL behind the iris. This procedure was followed by peripheral iridectomy through an anterior vitrectomy probe at the 4 o'clock position. At the end of the surgery, the viscoelastic material was removed and the incision was closed with three simple interrupted 10-0 nylon sutures. The wound was Seidel tested and found to be negative. Moxifloxacin and loteprednol etabonate drops were prescribed after surgery and slowly tapered over 4 weeks.

On the 1st day, slit-lamp examination revealed that the IOLs were centralized, pupil was round and centered, there was no inflammation in AC, Seidel test was found to be negative, and IOP was 16 mmHg. At the 1st month follow-up, BCVA (with -1.25 DS -1.25 DC × 35 degrees) was 0.4 (0.4 logMAR). On slit-lamp examination, IOLs were centralized, pupil was round and centered, there was no inflammation in AC, IOP was 14 mmHg, and ECD was 2352 cells/mm^2. Anterior segment photographs showed enclavation of IOL in front of iris [Figs. 1 and 2], wherease IOLs in front of and behind iris were shown by the oculyzer [Fig. 3].

At the 3-month follow-up, BCVA and the results of slit-lamp examination remained unchanged. IOP was 12 mmHg, the ECD was 2391 cells/mm^2, and distance between corneal endothelium and ICIOL in front of iris was 2.2 mm [Fig. 3].

At the 1st year postoperative examination, BCVA (with − 1.50 D × 115 D) was 0.4 (0.4 log MAR), IOLs were well centered, pupil was normal, IOP was 14 mmHg, and ECD was 2246 cells/mm^2. ECD was 5.3% up since the preoperative period.

At the 3-year postoperative examination, the BCVA (with − 1.25 D × 120 D) was 0.4, both IOLs were well centered, the pupil was normal, the IOP was 15 mmHg, and ECD was 2240 cells/mm^2. ECD was 5.6% from the preoperative to the 3 postoperative years.

Discussion

Nanophthalmos is defined as an eye with a small corneal diameter ranging between 9.5 and 11 mm, a shallow AC depth ranging between 1 and 2.7 mm, an increased crystalline lens to total eye volume ratio, and an AL of 20.5 mm or less.[5] Nanophthalmic eyes are prone to primary angle closure glaucoma, uveal effusion, and papillomacular folds.[2,6] In addition, intraocular surgery in nanophthalmos is associated with significant intraoperative risks.[2,6]

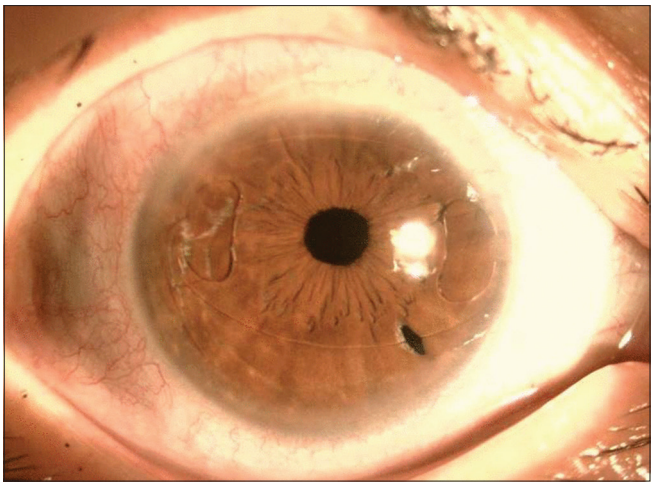

Figure 1: Anterior segment photography

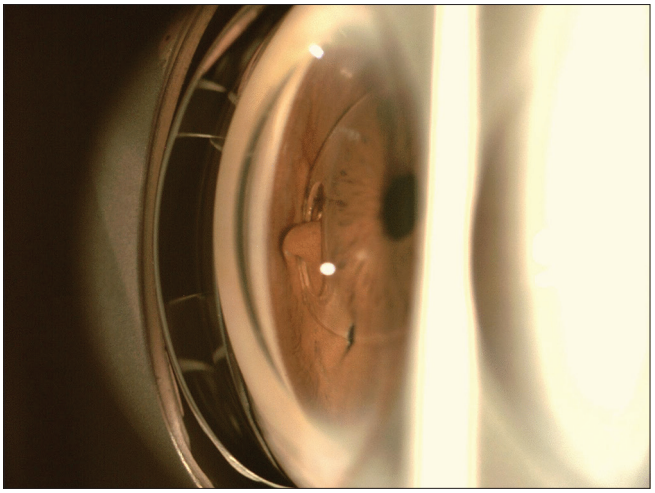

Figure 2: Enclavation of the intraocular lens in front of the iris through the gonioscopy three-mirror technique

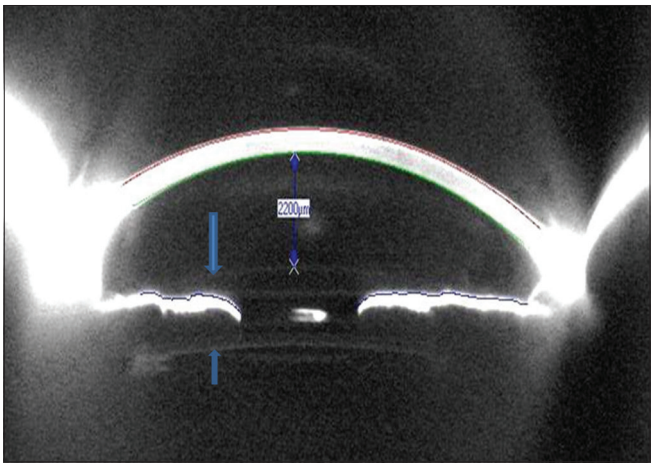

Figure 3: Iris claw intraocular lenses in front of (long arrow) and behind (short arrow) the iris

In such cases, there are several different techniques for IOL implantation including an angle supported anterior chamber IOL (ACIOL), sclerally fixated IOL, and ICIOL.

An angle supported ACIOL is rarely used due to long-term complications such as glaucoma, ECD loss, and uveitis.[3] In addition, sclerally fixated IOLs also have some drawbacks such as retinal detachment, IOL decentration, conjunctival erosion, and endophthalmitis.[7]

Iris fixated IOLs may also lead to postoperative complications such as ECD loss, pupillary ovalization, iris pigment dispersion, hyphema, dislocation of IOL haptic, high IOP, macular edema, and retinal detachment.[8,9] However, iris fixated IOLs have better visual outcomes, shorter surgical times, and lower incidences of intra- and post-operative complications than the other IOL types. Moreover, there are many reports about IOLs fixated to anterior and posterior of iris which showed safety, efficacy, and predictability of these lenses.[10]

Overall, in aphakic nanophthalmic eyes with inadequate capsular support, which require high IOL power, implantation of double aphakic IOLs is safe and provides good visual rehabilitation.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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