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CASE REPORT

Surgical management of dense cataract with glaucoma in nanophthalmos: A case report

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Abstract

Cataract surgery has some difficulties in nanophthalmic eyes; it may be possible to overcome these complications with some precautions. In the present study, we share the application of a phacoemulsification and pars plana anterior vitrectomy for the treatment of dense cataract and an iridozonulohyaloidectomy to counter the risk of malignant glaucoma in a patient with nanophthalmos following intraocular pressure (IOP) regulation by micropulse transscleral diode laser cyclophotocoagulation. The IOP of our patient became normal, his visual acuity increased significantly in the postoperative period, and no complications were observed.

Keywords: Cataract surgery: iridozonulohyaloidectomy: malignant glaucoma, nanophthalmos.

Cataract surgery in nanophthalmic eyes is difficult due to their anatomical structure. Intraoperative and postoperative complication rates are high. Our aim in this study is to share the procedures we performed in our nanophthalmic patient with dense cataracts and irregular intraocular pressure (IOP) and to give information about the complications that may occur in cataract surgery of nanophthalmic eyes.

Case Report

A 60-year-old male patient with bilateral nanophthalmos followed up for glaucoma for 20 years at another center had a history of bilateral surgical peripheral iridectomy and had twice undergone a bilateral trabeculectomy. The patient's visual acuity of the right eye was at the level of counting fingers at 1 m. The cornea was transparent in the right eye, seclusio pupil and peripheral iridectomy were observed in the iris at 12 o'clock, grade 4 nuclear sclerosis was present in the lens (Fig. 1). The posterior segment could not be seen, no vitreoretinal pathology was identified on B-scan ultrasonography. IOP was 30 mmHg, in spite of full antiglaucomatous medication (topical dorzolamide 2%/timolol 0.5% combination twice daily, brimonidine tartarate 0.15% 3 times daily, and latanoprost 0.005% once daily), and regressed to a level of 20 mmHg subsequent to a micropulse transscleral diode laser cyclophotocoagulation (IRIDEX Laser Systems) procedure. Two months after the cyclophotocoagulation procedure, phacoemulsification

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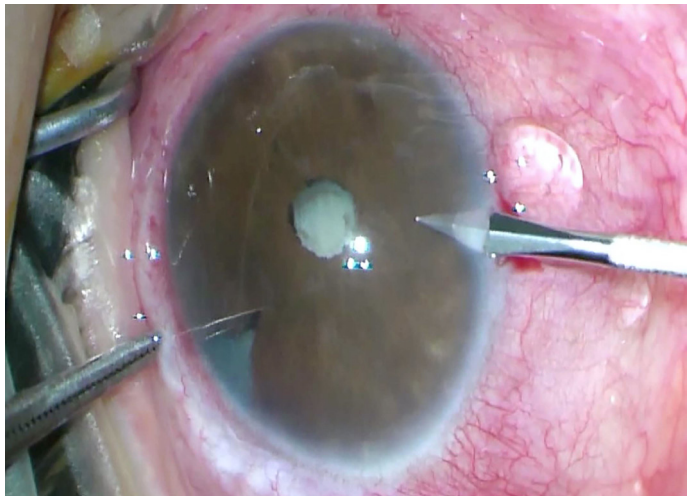

Fig. 1. Preoperative picture of the right eye. Seclusio pupil, dense cataract, and shallow anterior chamber are seen.

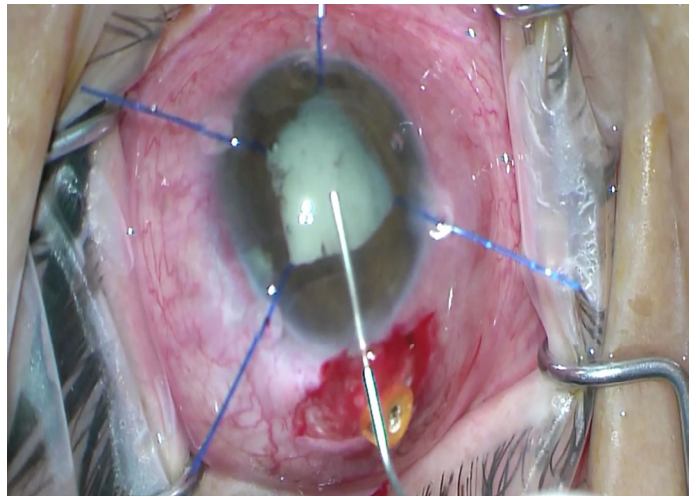

Fig. 2. Pars plana anterior vitrectomy was performed through sclerotomy from the inferior temporal quadrant, corneal incisions were made after the anterior chamber was enlarged and iris hooks were placed.

and intraocular lens (IOL) implantation under general anesthesia were planned for the right eye after the regulation of IOP. Informed consent was obtained from the patient before surgical procedure. The Barret-II and Hoffer Q formulae were used for the calculation of IOL power. Mannitol was administered intravenously preoperatively (1 mg/kg, 20%). A pars plana anterior vitrectomy (PPAV) was planned to decrease vitreous pressure prior to making the corneal incisions, since the anterior chamber was quite shallow. A sclerotomy was performed 3.0 mm posterior to the limbus in the lower temporal quadrant, trochar was placed, and a PPAV was performed. An expansion of the anterior chamber was observed, which facilitated intraocular manipulations. Subsequently, four-quadrant paracentesis was performed, viscoelastic was injected, and the synechiae were carefully dissected using a spatula. Cohesive (sodium hyaluronate 1.4%) and dispersive (sodium chondroitin sulfate 4%-sodium hyaluronate 3%) ophthalmic viscosurgical devices were used during surgery. Iris hooks were placed (Fig. 2). A viscoelastic agent was injected, and a clear corneal temporal 2.8 mm incision was made. The capsule was made apparent with a capsule dye. A capsulorhexis was performed, and the mature cataract was cleaned using the soft shell technique with torsional phacoemulsification. The main incision was enlarged before IOL implantation. A + 57.5 D monofocal, hydrofobic acrylic material IOL (Acriva UD613) was implanted into the bag. The overall diameter of the IOL and the optical diameter were 13 mm and 6 mm, respectively. An iridozonulohyaloidectomy around the peripheral iridectomy at 12 o'clock was performed using a vitrector to overcome the risk of malignant glaucoma. The corneal incision and sclerotomy were closed with sutures, and the paracentesis was closed with stromal hydration (Fig. 3). Refractive error was -1.00 D in the postoperative period, corrected visual acuity was increased to 6/10, and the IOP was 18 mmHg.

Discussion

The etiology of nanophthalmos is unknown, and its prevalence is <1%.[1] The axial length is short (<20.5 mm). The globe is small and hypermetropic but remains functional, typically positioned deep within the orbit and within a narrow palpebral fissure.[2] Protein flow is decreased through the Schlemm canal and the transscleral pathway due to the thick sclera, so uveal effusion, choroidal detachment, retinal detachment, and malignant glaucoma may occur.[3]

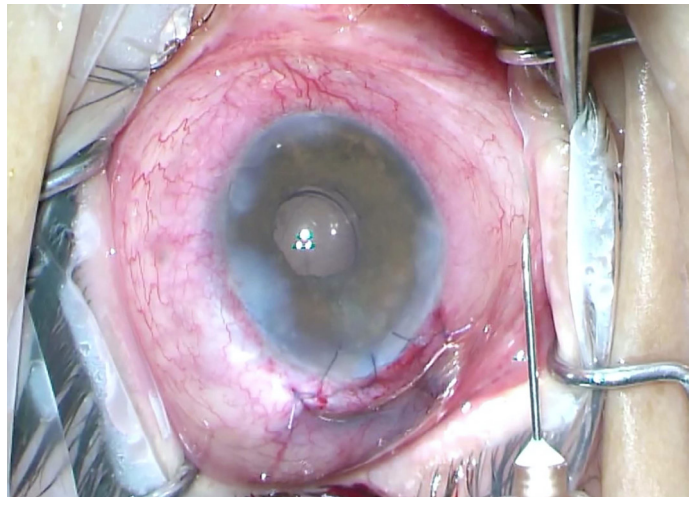

Fig. 3. Picture of the eye at the end of the operation after intraocular lens implantation into the bag.

The lens/eye volume ratio is 4% in normal eyes; it can increase to 10–30% in nanophthalmic eyes.[1] The anterior chamber becomes shallow due to the lens, and the iridocorneal angle narrows, so pupil block and angle closure glaucoma are common. Treatment options are laser peripheral iridotomy and iridoplasty, surgical iridectomy, filtration surgery, and lens extraction.[4] In such eyes, even if the patient does not have dense cataracts, lens extraction can be performed to relieve the angle. Cataract surgery was performed in our case, both to increase visual acuity and to contribute to a decrease in IOP. We performed micropulse transscleral diode laser cyclophotocoagulation in our patient. In this procedure, the ciliary body is targeted, and the production of aqueous humor is reduced. This method can be preferred in eyes that are not suitable for incisional glaucoma surgery or eyes with low visual acuity.[5]

Surgical manipulation is challenging in cataract surgery, since vitreous pressure is high and the anterior chamber is shallow. Capsulorhexis phase can become complicated, and recurrent iris prolapse can be seen. Retrobulbar anesthesia should be avoided. Mannitol can decrease the vitreous pressure. PPAV can be preferred in cases unresponsive to mannitol. With PPAV, the anterior chamber is deepened and surgical manipulations become safer.[4]

Perioperative anterior chamber pressure should be maintained to create the hydrostatic pressure that ensures the flow of proteins through the Schlemm canal and transscleral pathway. For this purpose, viscoelastic agents are used, and the level of the bottle can be increased. Preoperative lamellar sclerotomy has been recommended for postoperative uveal effusion in some studies.[3] In recent studies, postoperative uveal effusion has not been reported; it is thought that this was achieved by shortening the operation time as a result of developing phacoemulsification technologies.[1,6] Similarly, no postoperative uveal effusion developed in our case. Malignant glaucoma is a condition that develops due to the misdirection of the aqueous humor into the vitreous cavity and is expected in nanophthalmos.[4] It usually occurs perioperatively or in the 1st few days postoperatively, but it has been reported that malignant glaucoma can also occur years later.[7] The aim of treatment is to create a patent connection between the anterior and posterior chambers and to ensure normal circulation of aqueous humor.[4] Medical, laser, and surgical techniques have been described, and varying degrees of recurrence have been reported with each technique.[8] Feng et al.[4] performed zonulectomy, hyaloidectomy, and PPAV to prevent aqueous misdirection in the treatment of malignant glaucoma in a nanophthalmic eye. In the present patient, iridozonulohyaloidectomy – taking advantage of the existing iridectomy – and PPAV were performed for aqueous misdirection prophylaxis. It has also been reported that this technique gives better results in terms of recurrence.[8]

Since the anterior chamber is shallow, the handpiece remains close to the endothelium, so the ultrasound energy should be kept low. The endothelium can also be preserved by Arshinoff's soft shell technique.[9] Measurement of IOL power is difficult due to the anatomical structure. There is no consensus yet on which formula to use. In short eyes, Barret-II and Hoffer-Q formulas are accepted formulas with accurate results.[10,11] However, recently, the Olsen formula based on the ray tracing method and the Kane formula based on artificial intelligence have also been emphasized.[12] It is reported that refractive error rates are low and that they provide accurate results in short eyes.[12] The required IOL has a high diopter, and also the anterior chamber structures are small, so it is difficult to insert the IOL. Complications such as zonular dehiscence, posterior capsule damage, and IOL fracture may occur.

Conclusion

Cataract surgery is challenging in nanophthalmic eyes. Lens extraction is recommended to reduce IOP even if cataracts are not dense. PPAV and iridozonulohyaloidectomy procedures should be considered to avoid possible complications. Complications due to uveal effusion decreased with the development of phaco techniques. Patients should be informed about possible complications and that their visual acuity may not increase.

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