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Persistent pupillary membrane: a rare case and its surgical management

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Aim: To discuss the surgical outcome of the persistent pupillary membrane (PPM), which is a rare entity.
Case report: A female child aged seven and a half years has been reported to have had reduced vision in her right eye since birth. Her vision was counting fingers; after pupillary dilation, her vision improved to 6/24. A supranasal incision in the cornea was constructed under general anesthesia with a keratome of 3.2 mm size. A dispersive viscoelastic substance was introduced into the anterior chamber. The strands were excised with an iris scissor from their junction at the collarette. The viscoelastic material was removed, and a suture was placed. The post-operative patient was treated with cycloplegic, moxifloxacin, and dexamethasone eye drops. The pre- and post-operative periods were uneventful. After one and a half months, the patient's vision improved to 6/9 with a refraction +0.50 DS with +1.00 Cyl at 110^0.
Conclusion: Pupilloplasty with excision of iris strands of PPM is relatively a safe procedure and might improve visual acuity.

Keywords: persistent pupillary membrane (PPM), pupilloplasty, stimulus deprivation, amblyopia

Introduction

In the first 6 months of fetal life, the crystalline lens receives its nutrition from tunica vasculosa lentis. Rarely, the residue of the anterior tunica vasculosa lentis persists as an iris strand to a thick membrane, which represents the persistent pupillary membrane (PPM). Ninety-five percent of neonates have PPMs that subsequently regress, and 20% are present at adulthood (1). Thick PPM blocks the visual axis and may result in stimulus deprivation amblyopia, thus requiring early surgical removal of the PPM. Here, we describe a unilateral case of PPMs in a seven-and-a-half-year-old female child with dense PPM and the outcome of pupilloplasty.

Research elaborations: case report

A female child aged seven and a half years was presented to our cornea clinic with decreased vision in her right eye since birth. On examination, her right eye showed visual acuity, counting finger, normal eyelid, clear cornea, and deep anterior chamber, and the dense membrane nearly covered her pupil except a very small opening (**Figure 1A**). After pupillary dilation with tropicamide 0.8% and phenylephrine 5%, vision improved to 6/24 and the pupil looks like polycoria (**Figure 1B**) and fundus looks normal. Her left eye was completely normal with a visual acuity of 6/6. Gonioscopy of both eyes was an open angle with no abnormality. The intraocular pressure in both eyes was 15 mmHg. The patient was advised to excise the membrane under general anesthesia after counseling with her guardian.

Surgical procedure

After receiving the informed written consent from the mother of the patient, the procedure was started. The right eye was draped with proper aseptic precautions, which were performed under general anesthesia. A clear corneal

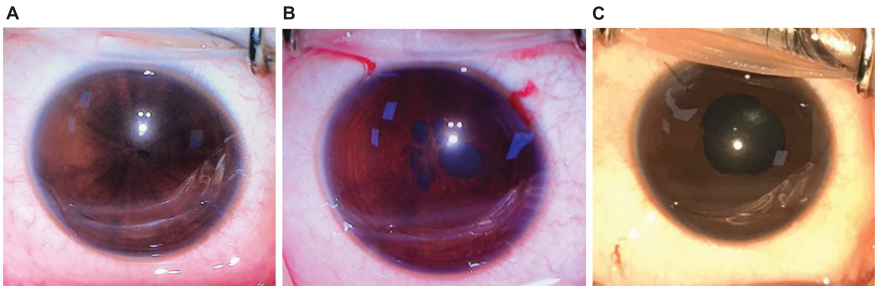

FIGURE 1 | (A) Thick pupillary membrane in the right eye with a small opening. **(B)** After dilatation, PPM was seen as polycorias. **(C)** After excision of PPM at junction with collarette, pupil became nearly round and a suture with 10-O nylon was placed.

beveled incision parallel to the iris plane was made with a 3.2 mm keratome at the 11.00 o'clock position (**Figure 1B**). The anterior chamber was filled with dispersive viscoelastic material (2.2% hydroxypropyl methylcellulose) and also the back of the persistent pupillary membrane to help separation from the underlying crystalline lens. The membranes were excised with an iris scissor from their junction at the collarette. The viscoelastic material was removed with "two-way Simcoe cannula" irrigation with a balanced salt solution. A suture was placed at the site of the incision with 10-O nylon (**Figure 1C**). At the end of surgery, the pupil looked nearly round and the crystalline lens was clear (**Figure 1C**). The post-operative patient was treated with cycloplegic atropine eye drop 1% three times daily for a week, moxifloxacin eye drop 0.5% daily four times for 2 weeks, and dexamethasone 0.1% eye drop daily four times for 2 weeks and then tapered over 1 month. The pre- and post-operative periods were uneventful. After one and a half months, the patient's vision improved to 6/9 with a refraction of +0.50 DS with +1.00 Cyl at 110^0.

Discussion

PPM constitutes the remainder portion of the anterior "tunica vasculosa lentis" that developed for nourishment of the developing crystalline lens during fetal life, particularly in the first 6 months (1). PPM is a sheet of mesodermal tissue containing blood vessels from anterior ciliary veins, which may be either uni- or bilateral with different shapes, sizes, and thicknesses and run between collarettes (2). Vision deprivation and amblyopia may result if the PPM is thick and totally blocks the pupil. On the posterior aspect of the developing crystalline lens, a vascular meshwork is formed by vessels originating from the hyaloid artery. This vascular meshwork forms an anastomosis with vessels of the "pupillary membrane" on the anterior aspect of the crystalline lens and forms tunica vasculosa lentis all around it (2). The tunica vasculosa fully developed approximately 9 weeks gestation and disappears by apoptosis shortly before birth (3). Failure of the regression of the pupillary membrane results in PPM, and failure of the regression of hyaloid vessels results in persistent hyperplasic primary vitreous (PHPV). PPM may be associated with microphthalmia, corneal opacification, cataract, and retinal dysplasia (2). PPM does not cause significant visual problems unless it is thick and covers the whole pupil. Small openings in the PPM may affect vision through diffraction, but they may provide good vision with the pinhole effect (4). In our case, there was a small aperture in the PPM. The post-operatively best corrected visual acuity was 6/9, most probably due to the pinhole effect of the small aperture, and the patient did not develop amblyopia.

Depending on the size and thickness of the "pupillary membrane" and the opening size of the pupil, treatment varies from conservative to surgical removal. Small PPMs do not need surgical intervention; some cases need conservative management with mydriatics, refractive error correction, and patching for amblyopia prevention (5). Membranectomy by Nd:YAG laser has been shown to be effective, but there is a chance of hyphema due to the presence of blood vessels in the PPM and cataract formation (6). Thick PPM may occlude the pupil more when the pupil becomes constrict, resulting in blurry vision, and needs surgical excision to improve vision in the adult and to prevent amblyopia development in children (7). Surgical removal of PPM carries a risk of hyphema, lens injury, and infection. In our patient, vision improved to 6/9 after surgical removal of PPM with a refraction of +0.50 DS with 1.00 Cyl at 110^0.

Conclusion

PPMs are a rare condition. Pupilloplasty with excision of iris strands of PPM is a relatively safe procedure and might improve visual acuity.

Author contributions

NC: case selection. SB: concept, design, and manuscript preparation. MA: literature search and manuscript editing. SR: manuscript review and grammatical correction. AB and ZN: literature review.

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