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Case report

Congenital glaucoma – a severe form

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Abstract

Primary congenital glaucoma is a rare disease and results from malformations of the trabecular meshwork that determines the increase of intraocular pressure (IOP). It is characterized by a globe enlargement, corneal edema and opacification. It also is associated with rupture of Descemet's membrane with Haab's striae, thinning of the anterior sclera and iris atrophy, normally with IOP above 21 mmHg.

We report a case of a full-term neonate girl in which a bilateral corneal opacity was observed. Ophthalmologic examination revealed corneal edema, Haab's striae and IOP of 37.3 mmHg in the right eye and 40 mmHg in the left eye. To achieve control of IOP, she performed sequential interventions: bilateral trabeculotomy; trabeculectomy and iridectomy on the left eye; and finally bilateral drainage implant.

In this patient, despite early diagnosis and multiple surgical interventions, the severe presentation and poor response to surgical treatment with maintenance of high IOP establishes an obscure prognosis. The child needs frequent follow-ups.

Keywords

Glaucoma, congenital, intraocular pressure, corneal opacification, newborn, trabeculectomy.

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Case description

We present a case of a full-term neonate girl, born by vaginal delivery after an uneventful pregnancy, who had a bilateral corneal opacity noticed after birth (**Fig. 1**). She had an unremarkable family medical history, particularly regarding childhood ophthalmologic disease. Somatometric parameters were appropriate for gestational age. A prompt ophthalmology appointment was scheduled where a full examination was performed although not all the structures from the anterior segment were properly seen because of the corneal edema, Haab's striae were present bilaterally.

She initiated topic β-blocker and a surgical intervention was scheduled on the 3rd day of life. She was electively admitted to the Neonatal Intensive Care Unit (NICU) to ensure the right post-surgical care.

During the observation under sedation, a corneal horizontal diameter of 12.0 mm was verified in the right eye (RE) and 12.5 mm in the left eye (LE), as well as an axial length of 20.46 mm in RE and 20.04 mm in LE. Intraocular pressure (IOP) was measured with both iCare® and Tono-Pen® AVIA® (Reichert® Technologies) and a mean of 37.3 mmHg in the RE and 40 mmHg in the LE were registered. The ophthalmology team performed a bilateral trabeculotomy.

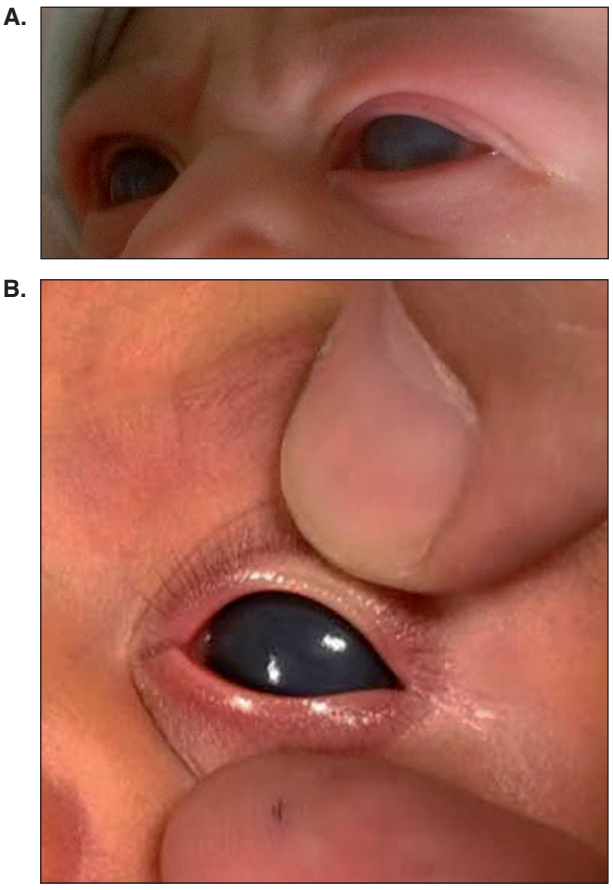

Figure 1. Bilateral corneal opacity noticed after birth.

The newborn started topic ofloxacin and prednisolone and stayed in the NICU, uneventfully, until the clinical discharge on the 8th day of life. Two weeks after the surgical intervention, a new increase in the IOP was observed, reaching values over 50 mmHg in the LE, despite being on topic medication with timolol. A new surgery was scheduled on the 26th day of life, where a trabeculectomy and iridectomy with mitomycin C were performed on the LE, with an initial good outcome. However, less than a month after, due the new increase of IOP in the LE, a new intervention was necessary, where a pediatric size Ahmed valve was implanted, with good control of the IOP. At 13 months, she had a drainage implant on the RE as well. The girl maintains a normal development and no syndromic associations have been found. Currently, she remains on hypotensor topic medication with β-blockers and prostaglandins and maintains a straight follow-up.

Discussion

Primary congenital glaucoma (PCG) is a major form of childhood glaucoma [1, 2]. It has an incidence variating across countries and ethnic groups [3, 4], estimated to be 1:10,000 to 1:70,000 in Western countries [3], affecting 66 million individuals worldwide [4, 5] and leaving 12 million sightless [5]. PCG is more prevalent in population with high rates of consanguinity [4, 5]. A male predominance, around 65% of the cases, is described [3, 5, 6]. The clinical presentation could be during the first month of life (neonatal glaucoma) or in the first 2 to 3 years of life (infantile glaucoma), being less severe the later the onset [1, 4, 7, 8].

PCG results from malformations of the trabecular meshwork that leads to diminished drainage of aqueous humor and determines the increase of IOP, resulting in degeneration of the optical nerve and vision loss [4, 7-9]. More studies would be necessary to fully understand the pathogenesis of this disease [4].

The presentation of PCG is more often bilateral [1, 3, 7]. The classic triad of symptoms include a globe enlargement (buphthalmos), photophobia and epiphora, but it could be absent in rare occasions [3, 8, 9]. In newborns, the normal corneal diameter ranges from 9.5 to 10.5 mm, and a diameter over 12 mm should prompt an alert [3, 7]. The corneal

enlargement causes the damage of Descemet's membrane, resulting in the presence of Haab's striae, that should be observed as an important hallmark [3, 4, 7, 8]. Corneal edema and opacification is frequently reported as well [3, 4, 7]. IOP > 21 mmHg is another important feature [7]. The quick detection and an adequate treatment could have an important improvement in visual outcome.

The primary step of treatment is to decrease IOP and its approach is almost always surgical [3, 7]. The options include angle surgery, drainage surgery and cyclophotocoagulation [2, 3, 7, 8]. If the corneal diameter is less than 13 mm, surgical possibilities are goniotomy or trabeculotomy. Trabeculotomy or goniotomy *ab externo* lowers the IOP through inserting a trabeculotome into the Schlemm's canal, which then tears through trabecular meshwork into the anterior chamber [3]. The glaucoma drainage devices are used as secondary choice, after failure of angle surgery [3, 7, 8].

Despite the fact that sporadic cases of PCG can occur [3, 6, 7], there is an autosomal recessive inheritance with variable penetrance [3, 6, 7]. Mutations in cytochrome P450 family 1 subfamily B member 1 (CYP1B1), myocilin (MYOC), latent transforming growth factor beta binding protein 2 (LTBP2), forkhead box C1 (FOXC1), collagen type I α1 chain (COL1A1), angiopoietin 1 (ANGTP1) and TEK receptor tyrosine kinase (TEK) have been related to PCG. [3-5, 7, 10]. The pathogenic role of CYP1B1 is one of the most studied. It has been associated with the development of the ocular anterior chamber, mainly the trabecular meshwork [4, 5, 10]. CYP1B1 mutations have an heterogenous distribution worldwide, and it has been found mostly in Saudi Arabia and Slovakian gypsy communities, where consanguinity marriage occurs more often [4-7, 10]. In Caucasians and nonconsanguineous populations, the risk of PCG seems to be less than 5% [6]. Besides that, the mutation seems to have some prognostic implications, since individuals with CYP1B1 pathogenic variants appears to need more surgical procedures but with a better prognosis [7]. However, associated genes and mechanisms related to PCG require more studies, and they could be helpful for future gene therapies [4].

Childhood glaucoma could be associated with other rare genetic diseases, including hypoplasia of corpus callosum or other genetic syndromes or conditions such as Axenfeld-Rieger syndrome, aniridia, anterior segment dysgenesis syndromes, microcornea, congenital hereditary endothelial dystrophy, Lowe syndrome, neurofibromatosis type 1, Nance-Horan syndrome or Sturge-Weber syndrome. If a systemic and ocular disease coexist, the hypothesis of a secondary cause should be excluded [4, 7, 8].

The prognostic in neonatal PCG is worse than in those with a later onset, since the last group usually has an excellent outcome with a single surgery [7] and has better visual acuity in a long-term follow-up [2, 7]. Infants with PCG with elevated IOP and cloudy areas at birth have an unfavorable outcome [7]. There are also some studies suggesting that unilaterally affected eyes face a worse visual prognostic and amblyopia was found to be the leading cause of it [2].

In this case, trabeculotomy was the most adequate first procedure, since the opaque cornea prevented good visualization of anterior chamber structures. As second line procedure following failed angle surgery, ophthalmologists either opt for a second angle surgery, or proceed with a filtration surgery, either a trabeculectomy or a drainage implant. In this case, a trabeculectomy with iridectomy was performed on the LE, then a drainage implant was done primarily in the LE and, finally, a drainage implant was done in the RE as well. Due to significant anatomical anomaly of the anterior drainage angle, there is a limited use of medical treatment in PCG. In this case it had the aim of adjunct surgery treatment to maximize IOP reduction. In early stages and young infants, the optic nerve cupping may be reversible due to the high elastic nature of the tissues [7].

Due the lack of prevalence of CYP1B1 mutations in our country, and since there is no family background of glaucoma or consanguinity, the genetic test was not performed in this case. In addition, the genetic mutations could not explain all causes of PCG. However, the test could be helpful to predict the recurrence risk of PCG in descendance or in future siblings.

With the presented case, the authors aim to emphasize the importance of early diagnosis in PCG, as it is essential to improve prognosis. In early days of life, it could be challenging and pediatricians should beware of this condition and routinely perform an accurate eye inspection during newborn examination. A high index of suspicion is crucial, followed by clinical specialized examination. This includes inspection of global eye appearance and symmetry, pupillary reflex, refraction, axial length and keratometry.

In this patient, despite early diagnosis and multiple surgical interventions, the severe presenta-

tion and poor response to surgical treatment with maintenance of high IOP establish an obscure prognosis. She may develop significant visual impairment, amblyopia and eventually become blind. Lifelong eye monitoring will be necessary.

Declaration of interest

The Authors declare that there is no conflict of interest.

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