Macular Hole in a Newborn Associated With Forceps Delivery

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ABSTRACT
A newborn who had familial high myopia presented with bilateral dense vitreous hemorrhage after forceps delivery. Vitrectomy in the right eye revealed a macular hole surrounded by pigmented cells. After subsequent surgery, the macular hole healed and remained closed during 10 years of follow-up, but profound amblyopia persisted. Macular hole is a possible complication of forceps delivery. Vitrectomy associated with inner limiting membrane peeling and gas tamponade was effective in closing macular hole in a newborn but was unable to prevent amblyopia. [J Pediatr Ophthalmol Strabismus 2010;47:e1-e3.]

INTRODUCTION
Ocular injury associated with birth is rare and generally related to instrumental delivery. The most common ocular abnormalities observed are retinal hemorrhages, which are present in 47% of infants delivered with forceps. Although these ophthalmologic findings have been documented in the literature, macular hole has not been described yet. This article presents a case of a newborn with bilateral vitreous hemorrhage after forceps delivery that was associated with macular hole in the right eye.

CASE REPORT
A 5-day-old female neonate born with forceps delivery after full-term, uncomplicated gestation was examined for ophthalmologic exploration because of a family history of vitreoretinal dystrophy associated with midfacial mild hypoplasia mimicking Stickler syndrome. Her father had developed retinal detachment with giant tear in both eyes before the age of 30 years and her sister was being observed for high myopia.

On initial examination, the anterior segment was normal but fundus exploration revealed bilateral vitreous hemorrhage. In the right eye, vitreous hemorrhage totally occluded the fundus, with fibrotic modification of the anterior hyaloid. In the left eye, vitreous hemorrhage was partial with no visible retinal lesion.

After a 2-month period of observation, 20-gauge pars plana vitrectomy was performed on the right eye for nonregressive hemorrhage. Vitrectomy with lens preservation was performed with no complications. After aspiration of the anterior cortical vitreous, which was adherent to the posterior capsule of the lens, we found a totally liquefied vitreous body. The retina was covered with a dense layer of pigmented cells mixed with blood elements that were removed with a back-flush needle. This revealed an oval macular hole measuring 900 × 600 µm in diameter, differing from regular idiopathic or traumatic macular hole because it presented with rolled-off edges surrounded by pigmented adherent cells. The retina in the macular area was thick with some retraction, but not detached (Fig. 1). Because we had no knowledge of macular hole in the newborn, we did not provide specific additional treatment.
The infant was followed up with an ophthalmologic examination twice a month. On the right eye, no recurrent vitreous hemorrhage occurred and the retina remained attached with no spontaneous closure of the macular hole. Vitreous hemorrhage in the left eye resolved spontaneously with no retinal complications.

Vision in the left eye developed normally but was poor in the right eye. The left eye was occluded, but this was not tolerated.

Based on these functional and anatomic findings, a second surgery associating inner limiting membrane peeling and gas tamponade using octafluoropropane $C_3F_8$ without posturing was performed at the age of 10 months, with no complications. Closure of the macular hole was obtained and has persisted over 10 years of follow-up (Figs. 2 and 3). The left eye was then occluded for 4 hours a day and tolerated by the child.

Cataract developed in the right eye at the age of 3 years and became progressively denser. Phacoemulsification without implantation was performed at the age of 5 years. No cataract has been noted in the left eye to date.

High myopia developed in both eyes, with an ocular axial length increasing from 20.2 mm at birth to 30.19 mm at the age of 8 years in the right eye and from 19.6 to 28.47 mm in the left eye.

Despite closure of the macular hole and early occlusion of the left eye, profound amblyopia persisted in the right eye, with nystagmus and progressive esotropic deviation. At the age of 10 years, Early Treatment of Diabetic Retinopathy Study visual acuity was five letters in her right eye and 82 letters in her left eye. The right fundus revealed a detached and slightly condensed floating membrane, probably corresponding to the detached anterior hyaloid, and normal foveal area with closed macular hole, without any visible scar (Fig. 3). The left fundus was normal.

**DISCUSSION**

To our knowledge, macular hole in a newborn delivered with forceps has never been reported. Traumatic macular holes are a rare but well-known complication of blunt ocular trauma.

For this newborn, several explanations of macular hole formation may be relevant. The most widely accepted pathogenic theory for traumatic macular hole is outward extension of the equator of the globe, causing flattening of the retina and tangential tractions. Forceps injury could have induced equatorial expansion and tangential traction on the fovea, leading to macular hole formation.
A second hypothesis is that initial injury could have caused a retinal commotion of the macular area, with delayed macular hole formation. In these cases, pigmented cells found around the hole would be the consequence of deposit of the vitreous hemorrhage.

The last theory is that forceps injury induced macular or submacular hemorrhage, causing mechanical pressure behind the fovea. This could lead to full-thickness macular hole formation with drainage of blood through the fovea into the vitreous cavity. The specific aspect of the macular hole, with the hole having rolled-off edges and blood cells on the retinal surface, is consistent with this third hypothesis. Inherited familial vitreoretinopathy could explain the liquefied aspect of the central vitreous body unable to firmly counterpressure the fovea. This last hypothesis contests the explanation developed by Ou et al. for a series of five macular holes observed in shaken baby syndrome.

Surgical intervention was performed successfully and provided prolonged macular hole closure. Despite a satisfactory anatomic result, visual recovery was poor. Many factors could have led to profound amblyopia. Factors such as anisometropia, high myopia, and extensive retinal damage associated with this specific macular hole could not have been modified, but the 2-month period of dense vitreous hemorrhage, the 8-month period of untreated macular hole, and the progressive development of post-vitrectomy dense cataract could have been avoided with earlier treatment.

Gas tamponade may have contributed to cataract formation as silicone oil would. Oil could have allowed an easier obturation of the hole without positioning but at the price of frequent emulsification in children, possible high intraocular pressure, and the need for a third operation to remove it. Our choice of $C_3F_8$ was warranted by better tolerance of gas in children and the fact that face-down positioning of infants during sleep was recommended at this time. Nevertheless, we thought that strict positioning was not mandatory if the bubble was large enough to obturate the hole by keeping its edges dry and if the supine position was avoided, all considerations that are recognized today.

The most likely causal factor for the limited functional result is the delayed macular hole surgery, undertaken at the age of 10 months. Because macular hole was discovered during vitrectomy and no data on surgical treatment in newborns were available at this time, we decided to observe the child for 8 months in hopes of spontaneous healing, as is done in traumatic macular hole in adults. We may also advocate retinal damage in the area centralis such as those seen in traumatic macular hole, but no anatomical anomalies or scars were seen on the fundus after the healing process.

Vitreous hemorrhage induced by forceps delivery can be associated with hidden traumatic macular hole. Vitrectomy with inner limiting membrane peeling and prolonged gas tamponade gave good anatomical results but did not prevent amblyopia. With a better understanding of its mechanism, we recommend an early surgical procedure with macular hole surgery at the same time.

REFERENCES