Published in final edited form as:

J AAPOS. 2011 December ; 15(6): 609–611. doi:10.1016/j.jaapos.2011.07.014.

Widespread retinal hemorrhages following retinopathy of prematurity screening with scleral depression

Anne K. Jensen, BA^a, Brian J. Forbes, MD, PhD^{a,b}, Lorri B. Wilson, MD^{a,b}, Debra Prieto, MD^c, and Gil Binenbaum, MD, MSCE^{a,b}

^aDivision of Ophthalmology, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania

^bScheie Eye Institute, Department of Ophthalmology, University of Pennsylvania, Philadelphia

^cVirtua Hospital, Voorhees, New Jersey

Abstract

We report a case of extensive bilateral intraretinal hemorrhages in a premature infant with active retinopathy of prematurity (ROP) following examination with scleral depression. In the only other previously reported case, the retinal hemorrhages were limited to the posterior pole of an eye with preexisting vitreous hemorrhage, and the child had a history of severe necrotizing enterocolitis that required surgery. Investigators have hypothesized that the combination of ocular manipulation, abrupt intraocular pressure change, and fragile immature retinal vasculature with poor autoregulation may contribute to the pathogenesis of retinal hemorrhages. Physicians performing ROP examinations should be aware of this possibility and judiciously use scleral depression; however, examination-induced retinal hemorrhages in children have never been reported in the absence of active ROP.

Case Report

A 90-day-old girl, who had been born at gestational age 26 weeks and birth weight 850 g, underwent a follow-up retinopathy of prematurity (ROP) examination with scleral depression and speculum at an outside hospital. Her postmenstrual age was 39 weeks. In the left eye, the referring pediatric ophthalmologist immediately identified, prior to the use of scleral depression, multiple diffuse, pale, round intraretinal hemorrhages clustered around the arcades and extending out to the neovascular ridge, where there were also linear hemorrhages along the ridge. The round retinal hemorrhages had not been present on the most recent examination, which had been performed by the same examiner one week prior using scleral depression. In the right eye there were linear hemorrhages scattered circumferentially along the ridge, but there were no retinal hemorrhages within the vascularized retina. In both eyes, there was stage 3, zone 2 ROP with pre-plus disease. There was no history of trauma, sepsis, or other bleeding. Past medical history included evolving chronic lung disease and patent ductus arteriosus ligation performed at 1 month of age. Pregnancy history was remarkable for premature labor and vaginal bleeding, and the mother was HIV negative, rapid plasma reagin (RPR) nonreactive, and rubella immune. Family

© 2011 American Association for Pediatric Ophthalmology and Strabismus. Published by Mosby, Inc. All rights reserved.

Correspondence: Gil Binenbaum, MD, MSCE, Children's Hospital of Philadelphia, 9 MAIN, Division of Ophthalmology, 34th St. and Civic Center Blvd, Philadelphia, PA 19104 (binenbaum@email.chop.edu).

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

history was negative for bleeding diathesis, though the mother had celiac disease and both parents were hearing impaired without a known-associated inherited syndrome.

The day after, pale intraretinal hemorrhages had been noted in the left eye and none noted in the right eye, the infant was transferred to our institution medically stable on nasal cannula oxygen for further evaluation. Examination by an attending physician without scleral depression or speculum now revealed bilateral extensive new, too-numerous-to-count intraretinal hemorrhages throughout the posterior pole and peripheral vascularized retina and stage 3, zone 2, pre-plus disease bilaterally. RetCam (Clarity Medical Systems, Pleasanton, CA) photography was performed after our examination on the day of transfer (Figure 1). One day later, there were stable retinal hemorrhages with progression of ROP to plus disease in the right eye, at which time bilateral peripheral laser treatment was performed, with near-confluent spots for 360°. Three days following the retinal photocoagulation, the intraretinal hemorrhages were beginning to resolve. Subsequent follow-up demonstrated good ROP response to the laser, and the girl was transferred back to the referring hospital. During the entire admission, she remained afebrile without signs of infection, and echocardiography found no evidence of endocarditis. Head ultrasound and clinical examination showed no evidence of intracranial hemorrhage or raised intracranial pressure. Hematologic and coagulopathic work-up was normal, including white blood cell counts, serum platelet counts, prothrombin time (PT), partial thromboplastin time (PTT), lupus anticoagulant, von Willebrand factor, and factor V Leiden mutation. Serum sodium, hemoglobin, and oxygen saturation were normal. Hematology consultation determined that the retinal hemorrhages were unlikely to have been secondary to a bleeding diathesis given lack of bleeding from puncture sites, negative family history, and negative laboratory work-up.

Discussion

The retinal hemorrhages observed in this infant were likely a result of scleral depression in the setting of active ROP. These retinal hemorrhages were diffuse and not located adjacent to the neovascular ridge. The retinal hemorrhages in the right eye were not present the day prior to hospital transfer but were extensive at the time of our initial examination within 12 hours of admission. The only interval events were the scleral depressed fundus examination and transfer via ambulance without incident. The retinal hemorrhages in the left eye that were seen on the day prior to transfer were not present one week prior on previous examination and were less extensive, with less distinct margins, than the retinal hemorrhages seen on admission to our institution. The only interval ocular or nonocular events were scleral depressed examinations the week prior and the day of examination. There was no clinical or laboratory evidence of coagulopathy, infection, or other systemic disease.

Three prior cases of iatrogenic posterior retinal hemorrhages in the setting of active ROP have been reported, associated with fundus examination, RetCam contact-fundus photography, or laser photocoagulation treatment.¹⁻³ While the precise etiology of the intraretinal hemorrhages is unknown, changes in intraocular pressure induced by scleral depression or by contact photography may overwhelm immature, pathologic retinal vessels unable to maintain consistent autoregulatory control. Immature retinal vasculature is relatively fragile and, like vessels in the germinal matrix, lacks structural support from smooth muscle, collagen, pericytes, and elastin and may therefore be susceptible to rupture.⁶ An underdeveloped autoregulatory system may further predispose to ischemia and hemorrhage.⁷ These are the same factors currently thought to underlie the pathogenesis of germinal matrix and intraventricular hemorrhages in premature neonates. Finally, the pathologic neovascularization of ROP itself may contribute to vessel fragility.

Scleral depression is sometimes required for ROP screening, as it allows visualization of disease extending into the retinal periphery when maneuvers such as head positioning do not provide an adequate view; however, the degree of ocular manipulation during scleral depression may vary depending on patient anatomy, extent of disease, and examiner technique. Reports have suggested that this manipulation may cause significant stress on the infant as measured by changes in heart rate and pain scores.^{4,5} Our findings emphasize the importance of judicious use of scleral depression in ROP screening and suggest that examination-induced retinal hemorrhages be considered on differential diagnosis in premature infants with active disease; however, examination-induced retinal hemorrhages, whether by scleral depression or fundus photography (Retcam), have never been reported outside the setting of active ROP, and there are no data to suggest that examination-induced retinal hemorrhages may occur in older infants with or without prior active ROP.

Acknowledgments

Disclosures/support: NIH K12 EY-015398

References

1. Lim Z, Tehrani NN, Levin AV. Retinal haemorrhages in a preterm infant following screening examination for retinopathy of prematurity. *Br J Ophthalmol*. 2006; 90:799–800. [PubMed: 16714274]
2. Adams GG, Clark BJ, Fang S, Hill M. Retinal haemorrhages in an infant following RetCam screening for retinopathy of prematurity. *Eye(Lond)*. 2004; 18:652–653. [PubMed: 14716332]
3. Mavrofrides EC, Berrocal AM, Murray TG. Subretinal hemorrhages during diode laser supplementation for retinopathy of prematurity. *J Pediatr Ophthalmol Strabismus*. 2006; 43:110–113. [PubMed: 16598980]
4. Kirchner L, Jeitler V, Pollak A, et al. Must screening examinations for retinopathy of prematurity necessarily be painful? *Retina*. 2009; 29:586–591. [PubMed: 19262437]
5. Belda S, Pallas CR, De la Cruz J, Tejada P. Screening for retinopathy of prematurity: Is it painful? *Biol Neonate*. 2004; 86:195–200. [PubMed: 15240989]
6. Anteby II, Anteby EY, Chen B, Hamvas A, McAlister W, Tychsen L. Retinal and intraventricular cerebral hemorrhages in the preterm infant born at or before 30 weeks' gestation. *J AAPOS*. 2001; 5:90–94. [PubMed: 11304816]
7. Greisen G. Autoregulation of cerebral blood flow in newborn babies. *Early Hum Dev*. 2005; 81:423–428. [PubMed: 15935919]

FIG 1. Bilateral, extensive, diffuse intraretinal hemorrhages 1 day following scleral depression. A, retinal periphery right eye; B, posterior pole right eye; C, posterior pole left eye; D, retinal periphery left eye. Stage 3 retinopathy of prematurity (D) and pre-plus disease (B, C) were present in both eyes as well.