American Journal of Ophthalmology Case Reports 29 (2023) 101785

Contents lists available at ScienceDirect

American Journal of Ophthalmology Case Reports

journal homepage: www.ajocasereports.com/

Rhegmatogenous retinal detachment after retinopathy of prematurity laser treatment

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ARTICLE INFO

Keywords:
Laser treatment
Rhegmatogenous retinal detachment
ROP

ABSTRACT

Purpose: Rhegmatogenous retinal detachment (RRD) after retinopathy of prematurity (ROP) laser is rare but has been reported to occur at the border of heavy laser or in combination with tractional retinal detachment (TRD). We describe a rare case of a RRD that developed during treatment for ROP with both laser and intravitreal injections.

Observations: The retinal detachment resolved with scleral buckling surgery with residual macular atrophy.

Conclusions and Importance: This case highlights the importance of retinal imaging, careful funduscopic examination, and consideration of the risk of RRDs after intravitreal injections and laser in neonates with ROP.

1. Introduction

Retinopathy of prematurity (ROP) is the leading cause of blindness in premature infants.[1] Laser photocoagulation which was the main treatment modality for ROP before anti-vascular endothelial growth factor (VEGF) has favorable outcomes in over 90% of eyes.[2] Complications of ROP laser include macular dragging and high myopia.[3,4] A rare complication of ROP laser is exudative retinal detachment (ERD),[5] thought to be due to a combination of inflammatory response and a leaky blood-retinal barrier in ROP.[6] Rhegmatogenous retinal detachment (RRD) after ROP laser is rare, but has been reported to occur at the border of heavy laser or in combination with tractional retinal detachment (TRD).[7] We present a complicated case of ROP with RRD after ROP laser and intravitreal injections.

2. Case report

A male with gestational age of 26-5/7 weeks (w) and birth weight of 600 g (g) with total parenteral nutrition (TPN) cholestasis, chronic respiratory failure, renal failure, sepsis, and genetic abnormalities (copy number gain at 15q26.3 with large stretches of homozygosity in multiple chromosomes) in the setting of consanguinity. Ophthalmic examination at 31-2/7w reportedly demonstrated zone 1, stage 0 ROP in both eyes (OU). Examination at 33 2/7w demonstrated, zone 1, stage 0 ROP in the right eye (OD) and zone 1, stage 1 ROP in the left eye (OS). At 34w the patient was transferred into our care. Examination at 34-3/7w demonstrated zone 2, stage 0 ROP without plus disease OU and 3 hemorrhages OS. The patient was followed weekly except for 2 examination deferrals secondary to medical instability.

Exam at 38-4/7w progressed to posterior zone 2, stage 3 ROP with plus disease OS (Fig. 1A), which was injected with ranibizumab (0.25mg/0.025 mL) 0.75 mm posterior to the limbus inferiorly. At the time of this injection, OD did not have Type 1 ROP, and therefore was not injected. The following week, OD progressed to zone 2, stage 3 with plus disease and was then injected similarly. At 47-3/7w plus disease recurred OU and the patient then received laser treatment OU. An initial dose of 3mg of IV hydrocortisone was administered 17 hours prior to laser treatment and, a second identical dose was given 9 hours prior to treatment (Fig. 1B). Laser settings were power 300 mW, spot size 400 μm, duration 300 milliseconds, and approximately 3000 spots in each eye. Within 1 week, OD developed a total retinal detachment with a possible atrophic hole (Fig. 2A & B) and was treated with 3.66mg IV hydrocortisone every 8 h for a total of seven doses. At the same time, OS was injected given worsening plus disease. After 4 days without improvement in OD, scleral buckle surgery was performed. Given recent ROP laser, cryotherapy was not used. One 5-0 mersilene mattress suture in each quadrant was used to fasten a 41 band to the sclera, 2mm behind the four rectus muscle insertions and secured with a 70 sleeve in the supero-nasal quadrant. A second ranibizumab (0.25mg/0.025mL) injection was given intraoperatively, and at the conclusion of which the

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https://doi.org/10.1016/j.ajoc.2022.101785
Received 16 June 2022; Received in revised form 11 December 2022; Accepted 21 December 2022
Available online 22 December 2022

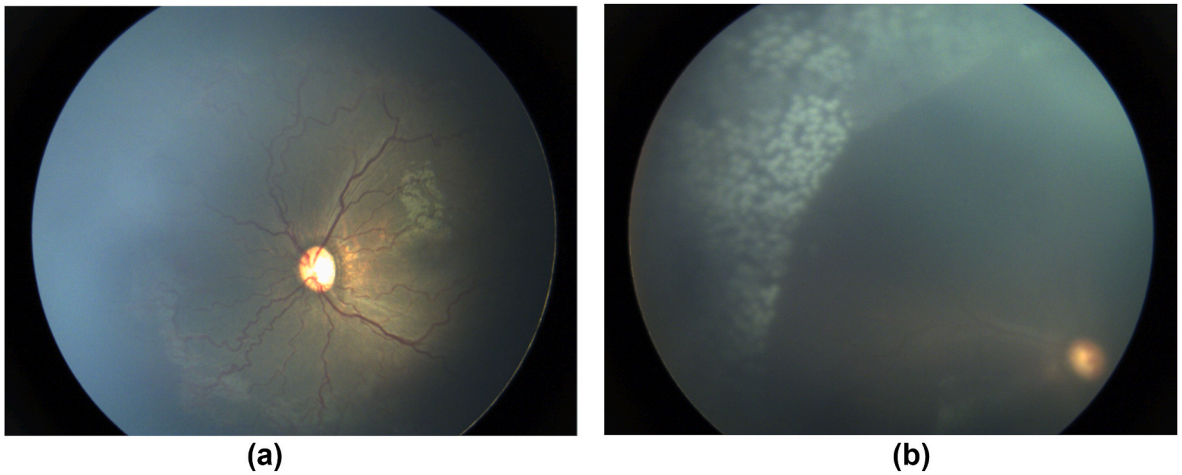

Fig. 1. Fundus photographs of (A) left eye taken before ranibizumab treatment at 38-4/7 weeks, showing zone 2, stage 3, plus disease, and (B) right eye taken 1 week after laser treatment at 47-3/7 demonstrating laser peripheral to avascular retina.

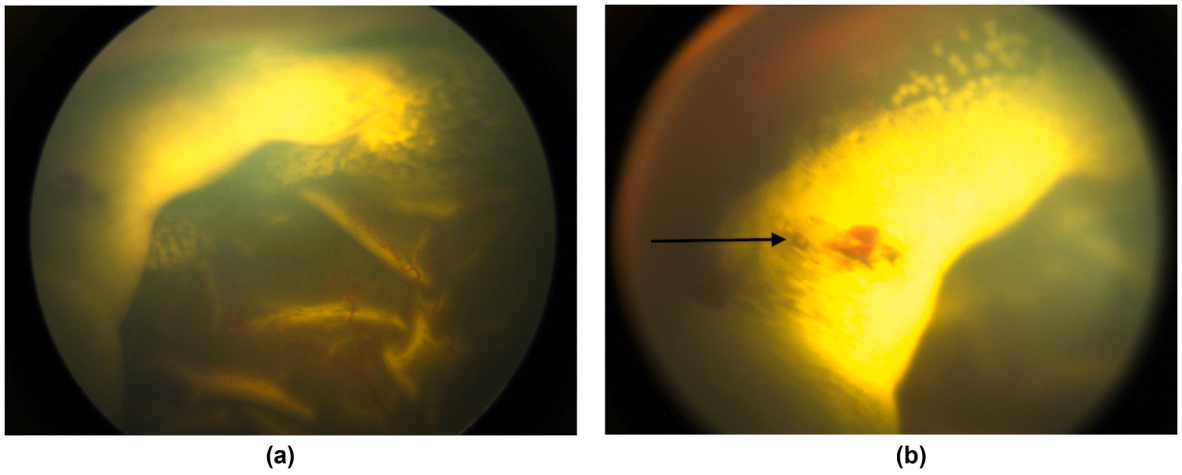

Fig. 2. (A) Fundus photo of right eye taken at 48-5/7 weeks showing bullous retinal detachment with a second fundus photo (B) demonstrating a retinal hole (black arrow).

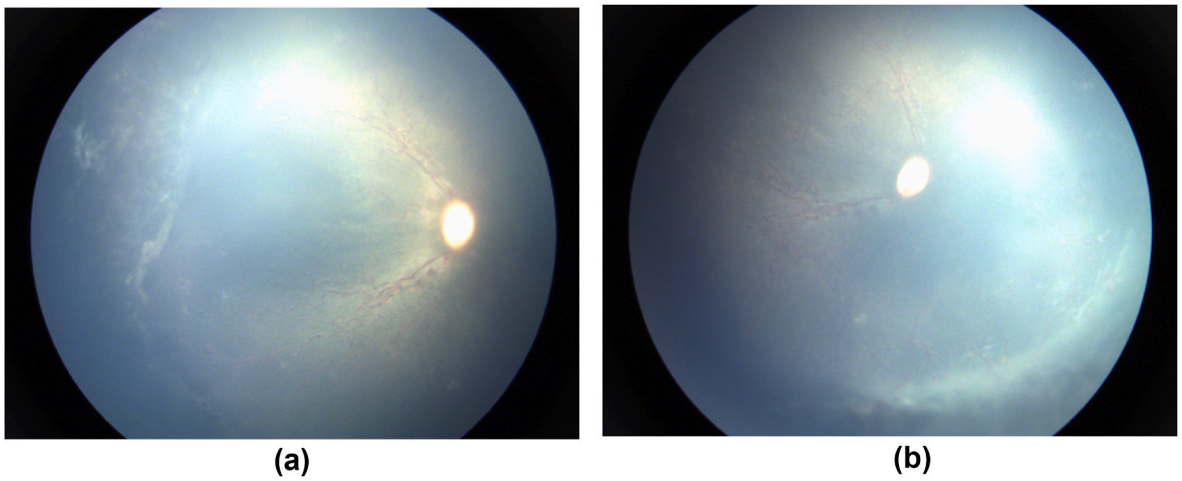

Fig. 3. Fundus photographs of right eye taken at 66 weeks, showing attached retina with persistent plus, laser peripheral to vascularized retina and fibrovascular tissue at the junction of vascular and avascular retina. (A) nasal (B) temporal.

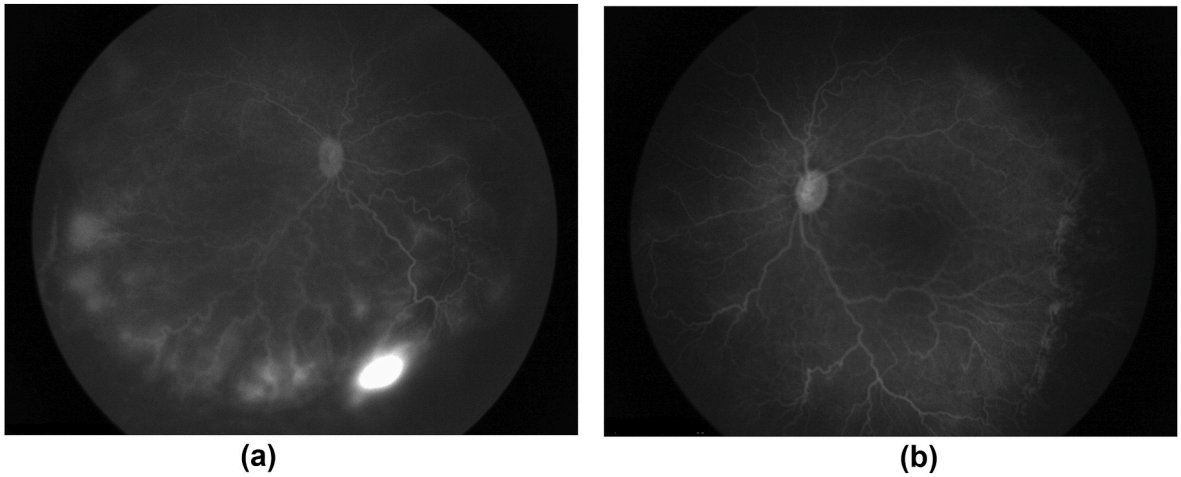

Fig. 4. FA of right eye (A) obtained at 65-67w, late recirculation phase demonstrating focal peripheral leakage and minimal staining at ridge site and of the left eye (B) obtained at the same timepoint, late recirculation phase demonstrating minimal staining at ridge site.

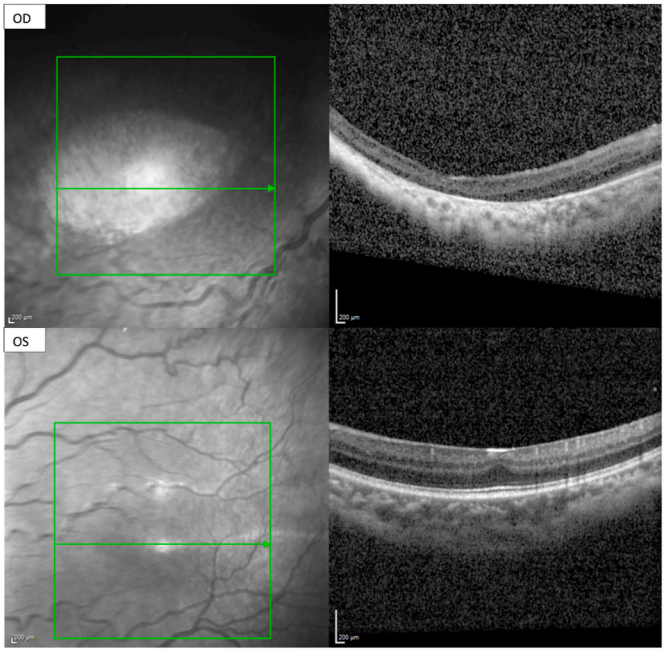

Fig. 5. OCT taken at 125-6/7 weeks right eye showing retinal pigment epithelium and outer retinal atrophy and left eye showing persistent inner retinal layers and an epiretinal membrane.

patient was given subconjunctival cefuroxime and dexamethasone. The additional ranibizumab was given as a precaution given concern for worsening ROP. Immediately post-operatively, the retina was noted to be attached and the subretinal fluid improved; this fluid eventually resolved completely in the subsequent weeks (Fig. 3A and B). At 51-3/7w, OD developed a relative afferent pupillary defect; OS showed regression of ROP. At 65-6/7w an additional fluorescein angiogram was obtained (Fig. 4a & b) which demonstrated only minimal focal leakage in one area in the periphery of both eyes and minimal vascular leakage at the ridge site. Three months after scleral buckle placement, it was recommended to the patient's family that the scleral buckle be removed to allow the globe to continue to grow. However, the patient was lost to follow-up. The patient returned for scleral buckle removal at 125-6/7w, and a macular optical coherence tomography OD obtained at this time demonstrated atrophy (Fig. 5). The patient died at age 2.5 years due to respiratory failure.

3. Discussion

This case demonstrates progressive ROP despite treatment and complications after multiple treatments. Up to 48% percent of ROP resolved without recurrence after a single intravitreal injection of ranibizumab,[8] but in our case, ROP recurred 9 weeks after injection. The parents were first cousins, and it is possible that this patient's ROP was confounded by familial exudative vitreoretinopathy. The combination of preterm birth in a patient with FEVR has been shown to have worse outcomes and requires meticulous follow-up and more aggressive treatment.[9,10] An angiogram obtained at 65-6/7 weeks showed a focal area of leakage, and the parents declined further genetic testing. The infant was followed with serial exams to look for progression of retinopathy. The area of focal leakage did not bleed or progress.

Because of disease progression, the patient received laser therapy at time of recurrent ROP and developed a bullous retinal detachment which was initially presumed to be an ERD with a suspicion of an atrophic hole. ERD is a well-documented, albeit uncommon, adverse event associated with ROP laser photocoagulation.[11,12] Such detachments can be treated with systemic steroids alone or in combination with intravitreal anti-VEGF.[13,14] It is also possible that some cases recognized as ERDs after laser may also have a rhegmatogenous component with retinal holes being plugged with vitreous as such spontaneous closures have been reported.[15] Given steroids failed to improve the patient's retinal detachment, surgery was then undertaken and ultimately led to resolution of the detachment. Our patient's presentation is therefore most consistent however with a pure RRD given that the detachment failed to respond to steroid administration and only improved following scleral buckle.

RRDs without a documented exudative component have been known to occur following ROP laser at the posterior border of heavy laser or in combination with traction,.[7,16] We do not believe traction played a role in our patient's case given no tractional membranes were noted intraoperatively. However, as the laser procedure had occurred just 6 days prior to the detachment, it is possible that excessive laser energy played a role in the development of the detachment. In our patient's case laser treatment was not placed directly onto the ridge, and we would recommend other treating physicians to avoid placing laser treatment directly onto the ridge to avoid bleeding in this area. RRDs have additionally been demonstrated to occur as a late complication following treatment of ROP with cryotherapy such as those three cases noted by Greven and Tasman (1989) where retinal tears occurred at the junction of treated and untreated retina; however, our patient's RD occurred while still <40 weeks PMA and within just 1 week of treatment.[17] One case series has demonstrated that RRDs may occur after the

development of a TRD as a relatively early adverse event following treatment of ROP with intravitreal injections in combination with laser treatment and surgery.[18]

While the development of our patient's RRD was noted one week following laser treatment, it also occurred 9 weeks after injection therapy. While RRDs following intravitreal injections occur uncommonly in adults (approximately 1/7500) and at an unspecified rate in neonates, they have been known to occur as an early and late complication following treatment of ROP with intravitreal injections due to vitreous traction or potentially even from entering posterior to the pars plana.[18–20] To prevent such complications, we recommend the injection site be measured 0.75–1.0mm posterior to the limbus as endorsed by the SAFER-ROP Study.[21] We also would suggest the injecting physician use a 4mm needle; however, if the shorter need is unavailable a 5/8 inch needle may be used, but not inserted to the hub. In our case, the atrophic hole was seen superiorly, and the injection was given inferiorly making the hole unlikely to have occurred from the needle entry.

Lastly, adhering to standardized methods of performing laser treatment for ROP may limit adverse events directly related to the procedure. Prior published literature suggests a starting power of 250 mW for 150–250 milliseconds for a total number of spots ranging from 2000 to 4000 (number of average spots depends on ROP zone).[22,23] The power settings of diode laser therapy depend on the location within the retina and the amount of pigment; posterior and inferior retina requires higher power or longer duration than anterior and superior retina as well as blonde fundi.[22] The laser settings in this case were similar to those documented in literature.

4. Conclusions

This case demonstrates recurrent ROP in the setting of multiple high-risk co-morbid conditions and possible FEVR. It also demonstrates the importance of retinal imaging and careful funduscopic examination to identify any retinal breaks even in the setting of what may initially appear to be an exudative process following ROP laser. As intravitreal anti-VEGF is gaining popularity as the first line treatment for posterior ROP, it is also important to consider the risk of RRDs after intravitreal injections in neonates.

Patient consent

Consent to publish the case report was not obtained. This report does not contain any personal information that could lead to the identification of the patient.

Funding

Unrestricted grant from Research to Prevent Blindness given to the Stein Eye Institute.

Authorship

All authors attest that they meet the current ICMJE for Authorship.

Declaration of competing interest

The following authors have no financial disclosures: R.G., Y.L., I.T.

Acknowledgements

None.

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