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Retinopathy of Prematurity

Developed by Scarlett Olejnik and Dr. Marc-Antoine Landry for PedsCases.com.
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Introduction:

Hi everyone and welcome to PedsCases. My name is Scarlett Olejnik and I am a senior medical student at the Medical University of Lodz in Poland. I worked with Dr. Marc-Antoine Landry, a neonatologist at the Royal Alexandra Hospital in Edmonton, Alberta to present to you an approach to Retinopathy of Prematurity. We hope you enjoy listening to our podcast and learn something as well!

Learning Objectives:

By the end of this podcast, you should be able to:

- Outline the general aspects of retinopathy of prematurity and which infants are at risk
- Discuss the general definition and how to diagnose retinopathy of prematurity
- Classify retinopathy of prematurity based on severity and location
- Develop an approach to the general management and treatment options for ROP
- Delineate late complications for infants diagnosed with ROP

Let's start with a case!

Case:

A male infant was born by caesarean section at 25 weeks gestation with a birth weight of 764 grams. His mother did not receive antenatal steroids. He was intubated and received two doses of surfactant in the first 24 hours of life. He necessitated up to 100% oxygen during the first days of life and remained intubated for many weeks due to severe hyaline membrane disease. The first ophthalmic examination was performed at a corrected gestational age (GA) of 31 weeks where ROP zone 1, stage 0 was found in both eyes. He was followed according to the national guidelines and because the ROP had gradually progressed to zone 2, stage 3 with plus disease in his left eye, he underwent laser photocoagulation.

Background information:

Retinopathy of prematurity (ROP) is an uncontrolled proliferation of blood vessels in premature infants that can potentially cause blindness and other complications. In most term infants, the retina and surrounding vasculature is fully developed, therefore, term infants do not develop ROP. Most cases of ROP do not result in damage to the retina and may resolve over time but in severe cases, the retina can detach from the wall of the eye and lead to retinal detachment, visual loss and blindness. The incidence of ROP has increased over time as smaller and younger infants are surviving premature births with the help of modern technologies.

Risk factors for ROP include:

- < 306/7 weeks gestational age
- Birth weight of <1250 g
- Reduced post-natal growth velocity and other factors such as transfusions and infants who received oxygen without saturation monitoring.

Classification:

ROP is classified by location (zones) and severity of abnormal vascularization (stages) according to the International Classification of Retinopathy of Prematurity (ICROP).
By location, zone 1 is the most posterior aspect of the retina and includes the optic nerve and macula and extends twice the distance from these two structures in a circle. Zone 1 is the earliest to develop. Zone 2 extends medially beyond zone 1, mostly nasally. Zone 3 extends laterally and includes a larger retinal area temporally.
By severity, stages range from 1 to 5 and are based on visual aspects of ROP. Stage 1 is characterized by a demarcation line (D-line) separating avascular from vascularized retina. Stage 2 shows a ridge arising in region of demarcation line. Stage 3 demonstrates an extraretinal fibrovascular proliferation or neovascularization extending into the vitreous. Stage 4 is when there is a partial retinal detachment and lastly, stage 5 is complete retinal detachment.
In addition to stages, there is also the concept of plus and pre-plus disease. Plus means that there is an increased vascular dilatation and tortuosity of the posterior retinal vessels in at least two quadrants of the retina. Pre-plus means that there is more vascular dilatation and tortuosity than normal but insufficient to make the diagnosis of plus disease.
Lastly, when combining the zones and the stages, we further classify ROP as type 1 or 2 to differentiate eyes with significant changes of ROP that requires treatment (type 1)

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from eyes with significant changes but that do not require treatment and must be carefully monitored (type 2).

Screening of ROP:

Retinal screening examinations should be performed after pupillary dilation by using binocular indirect ophthalmoscopy with a lid speculum and scleral depression, when indicated. Retinal examinations in preterm infants should be performed by an ophthalmologist who has sufficient knowledge and experience to accurately identify the location and extent of retinal changes.

The use of digital photographic retinal images that are captured and sent for remote interpretation is an alternative approach to ophthalmoscopic ROP screening. It is recommended that indirect ophthalmoscopy be performed at least once by a qualified ophthalmologist before treatment of infants at risk for ROP.

The scheduling of ROP screening examinations should ensure that eyes likely to need treatment are identified in a timely manner, but also limiting exams in those infants who are not at high risk as it can cause distress. Because ROP takes longest to develop in very immature infants, timing of the first examination should be based on postmenstrual age which is GA plus chronological age, rather than postnatal age.

For example, infants born at less than 28 weeks should have their first eye exam when they are 31 weeks corrected. Infants born at 28 weeks and beyond should have their first exam at four weeks of age.

Follow-up screening examinations should be recommended by the examining ophthalmologist. Extent of follow-up depends on the stage and the zone of the initial findings.

Eye examinations can cause distress and pain for the infant and may be associated with adverse physiological effects, including apnea, that are distressing to parents and may require changes of the infant's daily care.

Treatment of ROP:

Current indications for treatment are any of the following involvements (also known as Type 1 ROP):

- Zone 1 – any stage of ROP with plus disease
- Zone 1 – stage 3 ROP without plus disease
- Zone 2 – stage 2 or 3 with plus disease

Treatment of retinopathy of prematurity includes mainly retinal ablation (laser photocoagulation) and anti-vascular endothelial growth factors (anti-VEGF) therapy. According to a recent study, there seems to be less cases of myopia in infants treated with intravitreal Bevacizumab, a monoclonal antibody that blocks angiogenesis, than with traditional laser therapy. There is still insufficient evidence to prefer one treatment

over the other. Cryotherapy was the original choice of treatment with topical anesthesia that used a freezing probe directly on the avascular portion of the retina. Laser therapy (argon, xenon) has less complications than cryotherapy and therefore is more widely used.
Ideally, treatment should be initiated for type 1 ROP within 72 hours of its detection. Continuous follow up with an ophthalmologist is indicated regardless of the type of treatment within 4-6 months after NICU discharge. A longer period of follow-up is required when anti-VEGF therapy has been used.

Complications and Prognosis of ROP:

Retinal detachment and blindness are the major complications of ROP. When treated early and aggressively, treatment for ROP significantly reduces unfavorable structural and visual outcomes.
Regardless of whether infants at risk develop treatment-requiring ROP, pediatricians who care for infants who have been given the diagnosis of ROP should be conscious that these infants are at increased risk for other visual related disorders, such as strabismus, amblyopia, high refractive errors, cataracts, and glaucoma.

Now that we have discussed classification, screening, treatment and complications of ROP, let's follow up with our case.

Follow-up on our case:

Two weeks after laser photocoagulation, the plus disease and the vessels' ridges had nearly completely regressed. The treatment was considered successful and the infant had a favorable prognosis in regard to his condition.

Take-Home Points:

- Retinopathy of prematurity affects premature or low-birth weight infants due to incomplete vascularization of their retinas.
- Retinopathy of prematurity is classified based on location and severity of abnormal blood vessel proliferation.
- Early detection and management are crucial for preventing known complications of this disease such as retinal detachment and blindness.
- Treatment options include laser photocoagulation and anti-VEGF therapy.

Thank you for taking the time to listen to our podcast. We hope you learned something!

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