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Editorial

Screening for retinopathy of prematurity: no ophthalmologist required?

Retinopathy of prematurity (ROP) is a developmental disease usually occurring in premature infants, particularly those weighing less than 1250 g at birth. Screening examinations to detect the presence and severity of ROP are time consuming and technically difficult. Most of the significant findings are present in the peripheral retina at the leading edge of retinal vascular development. Diagnosing neovascularisation in ROP requires the use of an indirect ophthalmoscope and scleral indentation in unstable infants who often reside in a glass encased isolette. Learning to diagnose and manage ROP is complicated enough that most who perform screening examinations are well trained in the intricacies and subtleties of this disease.

Screening examinations usually start 4–6 weeks after birth and continue at frequent intervals either until ROP progresses to threshold disease, with neovascularisation at the leading edge of developing retinal vasculature, when treatment should be applied with laser or cryoretinal ablation, or until it regresses spontaneously. In many cases this window of vulnerability to development of threshold ROP lasts several months. However, the timing of diagnosis of threshold disease is crucial, as it is well known that threshold disease may progress and worsen rapidly.

The stakes in screening for ROP are high. Almost 50% of eyes reaching threshold for treatment would suffer poor visual and anatomical outcome without treatment, while approximately 70% of eyes that develop threshold disease and are treated in a timely fashion will undergo resolution of ROP.[1] Misdiagnosis or failure to intervene in a timely fashion can result in partial or total bilateral blindness for the remainder of the infant's life, with enormous social, developmental, and financial repercussions for the child and family. For all these reasons, screening examinations by well trained ophthalmologists have become accepted practice.

At first glance, then, it is surprising that Saunders *et al*, in this issue of the *BJO* (p 130), report on an ROP screening programme that utilises a relatively untrained non-ophthalmologist to perform screening examinations. These authors capitalise on an important clinical feature of ROP—namely, that threshold ROP is characterised by dilated and tortuous blood vessels, so called "plus disease" in the posterior pole of the eye. These dilated vessels accompany peripheral neovascularisation and can potentially be observed with the direct ophthalmoscope, an instrument far easier to learn to use than the indirect ophthalmoscope. In their screening examination study, the authors compared the non-ophthalmologist with trained ophthalmologists and concluded that the non-ophthalmologist using a direct ophthalmoscope is capable of performing screening ROP examinations and will not miss any cases of threshold disease. In other words, screening examinations could be performed by non-ophthalmology personnel. Does it make sense to consider the use of non-ophthalmology personnel to screen for ROP? Before considering this question, a few general comments about screening tests are in order.

Screening examinations of any sort are usually judged by standards of sensitivity and specificity. Sensitivity indicates the ability of the screening examination to identify cases of a disease (in this case, ROP). The greater the sensitivity the less likely the examination will miss cases of the disease. A screening test could be 100% sensitive but misdiagnose a large number of normal cases, leading to false positive results and unnecessary referrals. Specificity of a screening test refers to the test's ability to accurately diagnose a condition and to avoid false positive results.

Saunders *et al* report 100% sensitivity of their screening programme—that is, their non-ophthalmologist missed no cases of threshold ROP. However, the specificity of the screening test was poor, with a substantial number of cases mistakenly diagnosed as possible plus disease (retinovascular abnormalities of the posterior pole), when in fact the eye not only had no threshold disease, but also had either no ROP or less than threshold ROP. In real life terms, this means that the screening non-ophthalmologist would refer a large percentage of cases to the ophthalmologist because he/she mistakenly thought the eye had threshold disease. In this report, approximately 66% of cases screened would have been referred to the ophthalmologist with only a few of these requiring treatment. Also in real life terms, since threshold ROP requires prompt treatment, the ophthalmologist consultant would need to see the infant quickly and to implement treatment within a matter of days if threshold disease were present.

Clearly, the screening programme described by Saunders *et al* is not ideal. Interpretation of the results of this

study should be judged by other factors as well, as noted by the authors.

The criteria used by the group to distinguish plus disease are potentially problematic. Based on their own previous study of plus disease in ROP, the authors distinguish between dilated and tortuous posterior pole venules versus arterioles.[2] Dilated arterioles are an ominous finding, while dilated venules are not. The screening non-ophthalmologist had a difficult time diagnosing dilated venules, at times recording false positive findings, at other times false negative findings. The authors could be correct about the significance of venules versus arterioles, but further validation of their previous work seems warranted before predicating a screening programme on its findings.

Despite these issues, the authors have succeeded in defining and testing a new, highly sensitive method to screen for ROP. The next frontier is to improve the specificity of the screening test, all the while keeping costs down. Future directions in ROP screening could involve the use of photographic evaluation, for example. In this case a non-ophthalmologist could take a camera to the bedside and photographically document fundus findings. This screening procedure could improve specificity considerably. Note also that genetic markers for severe ROP are under investigation, with mutations of the gene encoding Norrin protein suspected as playing a part in advanced cases of ROP.[3] Undoubtedly there will be other markers and factors that can be screened and measured in premature infants as our understanding of molecular alterations in ROP improves.

The comments above notwithstanding, it is the low risk of developing threshold disease in premature infants that arguably makes this condition a particularly attractive one for which to develop more efficient screening tests. The ophthalmologist's time would be better utilised if he/she consulted on near threshold cases, and became involved in treatment and follow up. Furthermore, ROP will probably become an important and prevalent problem in developing nations, where ophthalmology resources are scarce. Until screening tests for ROP improve, though, the ophthalmologist will still have to be at, or very near, the infant's bedside in order to provide necessary direction in the management of these challenging cases.

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1 Cryotherapy for Retinopathy of Prematurity Cooperative Group. Multicenter trial of cryotherapy for retinopathy of prematurity: three month outcome. *Arch Ophthalmol* 1990;**108**:195–204.
2 Saunders RA, Bluestein EC, Sinatra RB, *et al*. The predictive value of posterior pole vessels in retinopathy of prematurity. *J Pediatr Ophthalmol Strabismus* 1995;**32**:82–5.
3 Shastry BS, Pendergast SD, Hartzer MK, *et al*. Identification of missense mutations in the Norrie disease gene associated with advanced retinopathy of prematurity. *Arch Ophthalmol* 1997;**115**:651–5.