Using ERGs to Contrast Ablation to Bevacizumab Injection for Treatment of ROP

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Fundus of healthy eye

Fundus of eye with ROP

As shown at left, high-risk retinopathy of prematurity (ROP) is clinically characterized by abnormal retinal blood vessels at the back of the eye. Additionally, there is persistent dysfunction of the neural retina. Fortunately, supplemental oxygen protects the preterm infant from cardiovascular complications. Unfortunately, upon return to room air, molecular messengers, such as vascular endothelial growth factor (VEGF), are upregulated and cause the proliferation of tenuous vessels that can leak and eventually cause retinal detachment. Conventional ROP management involves identifying high-risk vascular patterns early and then ablating the peripheral vessels before they detach the retina. Recently, intravitreal injection of an anti-VEGF antibody, bevacizumab, has been trialed with promising results—but, since VEGF is a trophic factor for neurons, concerns persist. The ultimate aim is to find the best ROP intervention to preserve vision.

To evaluate the safety of bevacizumab in the delicate, developing retina, the function of the photoreceptors and postreceptor retinal neurons was evaluated using the electroretinogram (ERG), a noninvasive measure of cellular function. ERGs were obtained from the dark-adapted eyes of subjects with a history of ROP that were treated either using bevacizumab (n=11) or conventional ablative therapy (n=10) using a series of flashes covering a ~3.6 log unit range of intensities; intensity was specified as the number of rhodopsin molecules isomerized by the flash in each rod (R*).

Sensitivity and amplitude of the rod photoreceptor and the response in the postreceptor (i.e., bipolar) cells was obtained by mathematical modeling and expressed as log normal for age. Linear mixed modeling was used to group differences for statistical significance.

These data suggest that treating patients using bevacizumab may result in better retinal functional outcomes than using conventional ablative methods. In particular, this analysis found that a pronounced deficit in photoreceptor sensitivity following conventional treatment benefitted from treatment using bevacizumab.

If these results are confirmed over the longer-term, this would be compelling evidence that severe ROP may be better treated using bevacizumab (or other anti-VEGF antibodies) than using conventional, ablative interventions.

References

1. ICROP. Arch Ophthalmol. 2005;123:991

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