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Novel mechanistic concepts in the pathogenesis of diabetic retinopathy

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Abstract

Chronic hyperglycemia is a major inducer of diabetic retinopathy, a prominent microvascular complication of both type 1 and type 2 diabetes. Diabetic retinopathy is the leading cause of blindness in the working age population for which unfortunately there is no preventative therapy. One of the fundamental changes closely associated with the development of diabetic retinopathy is the thickening of the basement membrane (BM) in the small blood vessels of the diabetic retina. Several years of research has established hyperglycemia, the most prevalent characteristic of diabetes, as a primary causal factor mediating this alteration. Studies have established the negative impact of hyperglycemia on the pathogenesis of diabetic retinopathy; however, the specific cellular mechanisms that lead to the dysfunction of small vessels in diabetes are unclear. In particular, it is unknown if vascular BM thickening promotes serious structural and functional abnormalities in the diabetic retina. While the association between BM thickening and the development and progression of diabetic retinopathy has been observed long ago, only recently new evidences have come to light that indicate vascular BM thickening plays a causal role in the pathogenesis of diabetic retinopathy. Our research has identified several BM genes, fibronectin, collagen IV, laminin, and cellular events involving connexin-43 gap junction intercellular communication that are significant players in mediating hyperglycemia-driven vascular lesions. These changes underlie some of the critical pathogenetic roles played by the thickened BM in promoting characteristic vascular lesions associated with diabetic retinopathy.

Biography

Sayon Roy received his PhD from Boston University and completed his postdoctoral training at Schepens Eye Research Institute, Harvard Medical School, Harvard University. Dr. Roy is currently a professor of Medicine, Section of Diabetes, Endocrinology and Nutrition, and a professor of Ophthalmology at Boston University School of Medicine. Recognized as an expert in retinal vascular biology, Dr. Roy's seminal work has identified several genes in the retina that are abnormally expressed in diabetic retinopathy. His pioneering work has led to novel gene modulatory techniques in retinal vascular cells using antisense oligonucleotides via intravitreal injection. Dr. Roy has received numerous awards including the American Diabetes Association Research Award for the commitment and dedication towards the fight against diabetes, the 2006 Mentor of the Year Award from Boston University, and the 2008 Innovative Award from the Juvenile Diabetes Research Foundation. Research in Dr. Roy's laboratory has been funded by several organizations including the National Eye Institute, NIH, National Medical Technology Testbed, American Diabetes Association, Juvenile Diabetes Research Foundation International, Fight for Sight, Research to Prevent Blindness, and the Lions Organization. Dr. Roy currently serves as a chartered member of the NEI Study Section of the National Institutes of Health.