Retinal Endothelial Cell Surface Proteins and Oxidative Stress in Hyperglycemia

Warar, Ravdeep (School: Caddo Parish Magnet High School)

Diabetic retinopathy (DR) is a complication of diabetes that can lead to blindness and is the leading cause of blindness in working-age adults. DR will affect most type-1 diabetic (T1D) patients to a certain extent. The glycocalyx is an endothelial surface layer that consists of cell surface proteins (CSPs). Evidence has suggested that the CSPs are degraded or decreased from blood vessels in T1D. Therefore, it's hypothesized that endothelial CSPs will decrease in expression under hyperglycemic conditions and oxidative stress markers will show an increase. Using rat retinal microvascular endothelial cells to model T1D, western blotting was used to measure the levels of endothelial CSP expression and oxidative stress markers. Two adhesion proteins VE-Cadherin and PECAM-1 showed a significant decrease of expression in diabetic endothelial cells. Stress markers Nitrotyrosine and P22-Phox showed no change between normal glucose and high glucose conditions; however, 4-HNE showed a significant decrease in high glucose conditions. VCAM-1, an inflammatory marker, showed a significant increase in expression under hyperglycemic conditions. A hypoxia marker was tested to check for pseudohypoxia, and it showed a significant decrease in expression for high glucose conditions. Cobalt chloride was used to ensure the hypoxia marker results were accurate, and they were deemed as so. Information on the retina in DR can only aid in explaining these novel results, early diagnosis of the disease, and the creation of a better quality of life for diabetic patients.