Compounding Effects of Hyperlipidemia and Hyperglycemia in the Exacerbation and Early Detection of Diabetic Retinopathy

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Diabetic retinopathy is a leading cause of blindness among adults and although surgical procedures exist, they're only viable in the disease's earliest stages, which are rarely detected using current leakage analysis techniques.This project aimed to develop more accurate and targeted early detection techniques for diabetic retinopathy by incorporating the characteristics of 4 disease models: lean(- control), ZDF(hyperglycemic and hyperlipidemic), poor control(+ control), and poor control-good control(diabetic treatment). I hypothesized that diabetic treatment would cause reduced disease severity while hyperlipidemia would increase severity. Using 7 different assessments for comprehensiveness within 4 clinical tests, methodology included retinal vessel analysis, retinal efficiency, retinal size, and leakage analysis with a novel differentiation from diffusion. Results indicated that hyperlipidemia not only increases leakage severity/acceleration, but also increases retinal/vessel size and deficiency early in development. Despite controlling hyperglycemia, diabetic treatment(PCGC) was ineffective in retinopathic control. Analysis of disease progression(6,12,28 weeks) and model comparison revealed crucial previously unrecognized patterns of early development including optic disc leakage and minor abnormal capillary growth. Results are supported by up-regulated cytokine production. This project overall identified hyperlipidemia as an exacerbator of diabetic retinopathy, demonstrated the ineffectiveness of diabetic treatment on disease progression, and incorporated the methods used to find these conclusions to develop a technique for earlier detection using clinically available machinery, hence a solution to a chief cause of an incredibly debilitating condition, blindness.

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