MODULE 6.8
Renin-Angiotensin System

The renin-angiotensin system (RAS), also known as the renin-angiotensin-aldosterone system, is an endocrine system that plays important roles in the regulation of blood pressure and fluid balance.[1] The RAS shows aberration in patients with type 2 diabetes. In proliferative diabetic retinopathy (DR), expression of the receptors and signaling molecules of the RAS are increased in the retina. These are, namely, renin, angiotensin-converting enzymes (ACE) I and II, and angiotensin receptors. These changes are independent of systemic blood pressure.[1]

The RAS has been identified as a causative factor in diabetic microvascular complications, inducing a variety of tissue responses that include vasoconstriction, inflammation, oxidative stress, cell hypertrophy and proliferation, angiogenesis, and fibrosis. Evidence from clinical and experimental models suggests that the RAS is upregulated in DR. Retinal dysfunction in these models has been linked to angiotensin-mediated induction of growth factors including vascular endothelial growth factor (VEGF).[2]

The precise mechanism by which the RAS contributes to DR is not fully understood; however, experimental studies suggest that angiotensin II is involved in the activation of protein kinase C and in VEGF signaling.[1] Intraocular and serum levels of ACE and angiotensin II have been reported to be correlated with the severity of DR.[3]

References

1. Tarr JM, Kaul K, Chopra M, Kohner EM, Chibber R. Pathophysiology of diabetic retinopathy. *ISRN Ophthalmol.* 2013;2013:343560.

2. Wilkinson-Berka JL. Angiotensin and diabetic retinopathy. *Int J Biochem Cell Biol.* 2006;38:752-765.

3. Otani A, Takagi H, Suzuma K, Honda Y. Angiotensin II potentiates vascular endothelial growth factor-induced angiogenic activity in retinal microcapillary endothelial cells. *Circ Res.* 1998;82:619-628.