FGF-Induced Angiogenesis of Arterial Endothelial Cell in 3D-Microfluidic System

Department of Cardiology, Korea University Anam Hospitial

Hyung Joon Joo M.D., Ph.D.

Neo-angiogenesis is an essential process to enhance vessel regeneration. Many studies have focused on the endothelial cells to explore the novel mechanisms underlying angiogenesis. Conventionally, human umbilical vein endothelial cells (HUVECs) and human aortic endothelial cells (HAECs) are representative endothelial cell types isolated from human blood vessels. Both cell types showed similar cellular characteristics and morphology. However, considering their different cellular origins, both cell types could have different cellular characteristics. Nevertheless, the cellular characteristics of both HUVECs and HAECs have not yet been fully defined; both cell types are still used in various articles without classification. Indeed, microarray in the present study demonstrated different expression patterns of angiogenesis related factors among the different types of endothelial cells. By quantitative PCR, we confirmed that GBX2, FGF2, FGF5, and COL8A1 were up-regulated and ID, TSPAN12, CCL2, PTGS2, APOLD1, ANGPT2, and HOXA5 were down-regulated in HAECs compared to HUVECs. We focused on the different expressions in fibroblast growth factors (FGFs) between HAECs and HUVECs. Previously, FGFs has been also reported to be involved in angiogenesis. However, mice lacking individual FGFs revealed a variety of phenotypes, ranging from early embryonic lethality to mild defects. Therefore, role of FGFs during angiogenic process has been still poorly understood. Recently, three-dimensional (3D)-microfluidic angiogenesis systems have been adopted in vascular research. These systems have advantages of mimicking *in vivo*-like microenvironments and allowing *in situ* observation. Moreover, these allow detailed modulation of chemical gradients and physical stiffness in the extracellular matrix scaffold. We adopted the 3D-microfluidic angiogenesis system and compared *in vivo* mimicking vascular sprouting potential between HAECs and HUVECs. In the present study, we would investigate molecular and cellular differences between arterial endothelial cells (HAECs) and venous endothelial cells (HUVECs) and propose a novel role of FGFs during angiogenic process of arterial endothelial cells.