Investigating endothelial polarization and vascular diseases using zebrafish embryos

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Abstract
Endothelial cells (ECs) have the ability to align in the direction of flow in response to shear stress. However, how ECs respond to flow in complex *in vivo* environments is less clear. To analyze endothelial polarization *in vivo*, we generated an endothelial-specific transgenic line to mark the Golgi apparatus. We find that most ECs polarize within 4.5 hours after the onset of vigorous blood flow and, by manipulating cardiac function, observed that flow-induced EC polarization is a dynamic and reversible process. Based on its role in EC migration, we analyzed the role of Apelin signaling in EC polarization, and find that it is critical for this process. Knocking down Apelin receptor function in primary human ECs also affects their polarization. Our studies provide new tools to analyze the mechanisms of EC polarization *in vivo*, and reveal an important role in this process for a signaling pathway implicated in cardiovascular disease.