Impact of Fluid Shear Stress on the Morphology of Dermal Endothelial Cells
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As blood flows through blood vessels, the fluid exerts a shear stress on the endothelial cells (ECs) that line the vasculature. The traditional view on endothelial cells is that they align in the direction of applied fluid shear stress. However, recent studies have found that human brain microvascular ECs (HBMECs) are resistant to morphological change when under fluid shear stress. Therefore, further research is necessary to determine if other types of microvascular ECs react similarly to that of HBMECs. The objective of this research is to determine if shear stress resulting from laminar flow causes morphological changes in dermal human microvascular endothelial cells (HMEC-1).

A monolayer of HMEC-1 were exposed to a fluid shear stress of 15 dyne/cm² and imaged for 48 hours. Images of the live cell membrane and stained nuclei were captured hourly. After 48 hours, the f-actin was stained and imaged by confocal microscopy. These images were then processed and segmented using FIJI. To determine if nuclear and cellular morphology differed in comparison to no-flow conditions, the following were calculated: inverse aspect ratio; orientation of cells with respect to flow direction; area; circularity. In addition, the distribution of f-actin was compared between flow and no-flow conditions.

The results of this study will demonstrate the morphological response of dermal microvascular endothelial cells to fluid shear stress. Because these cells play an important role in angiogenesis and wound healing, these results could contribute to potential novel mechanotherapies of wound healing.