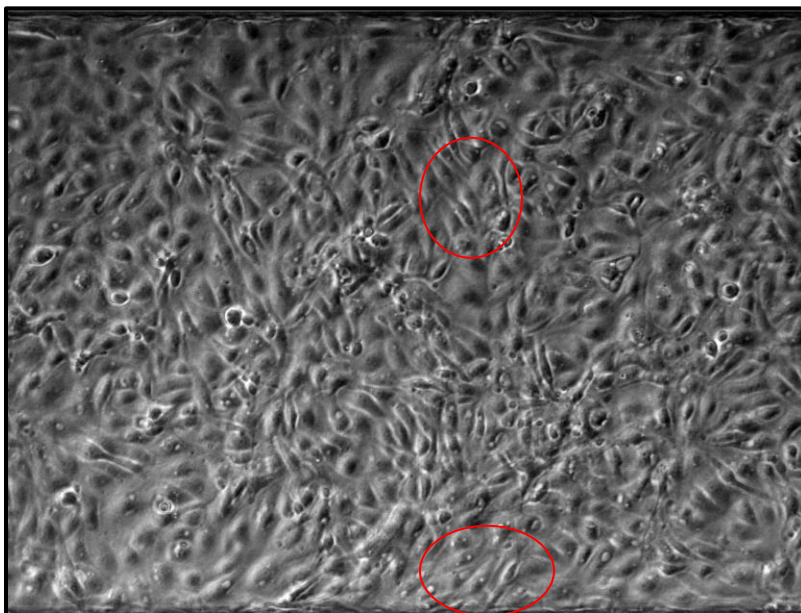
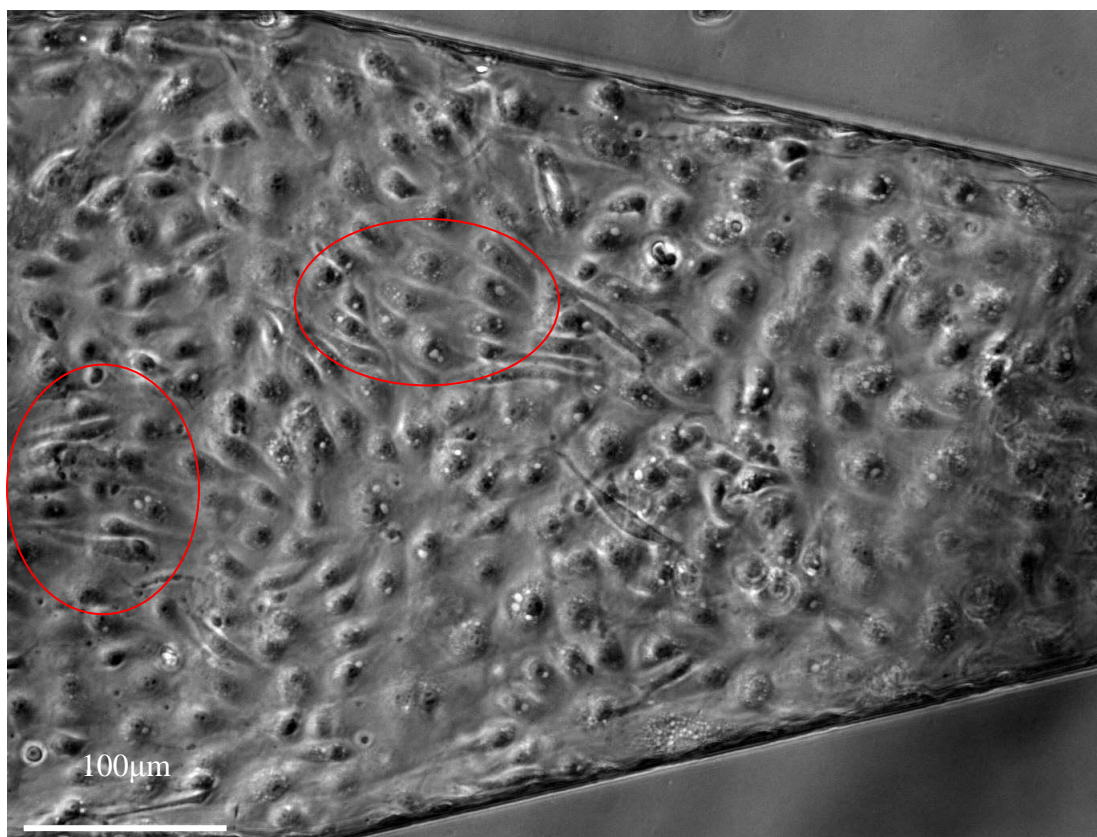


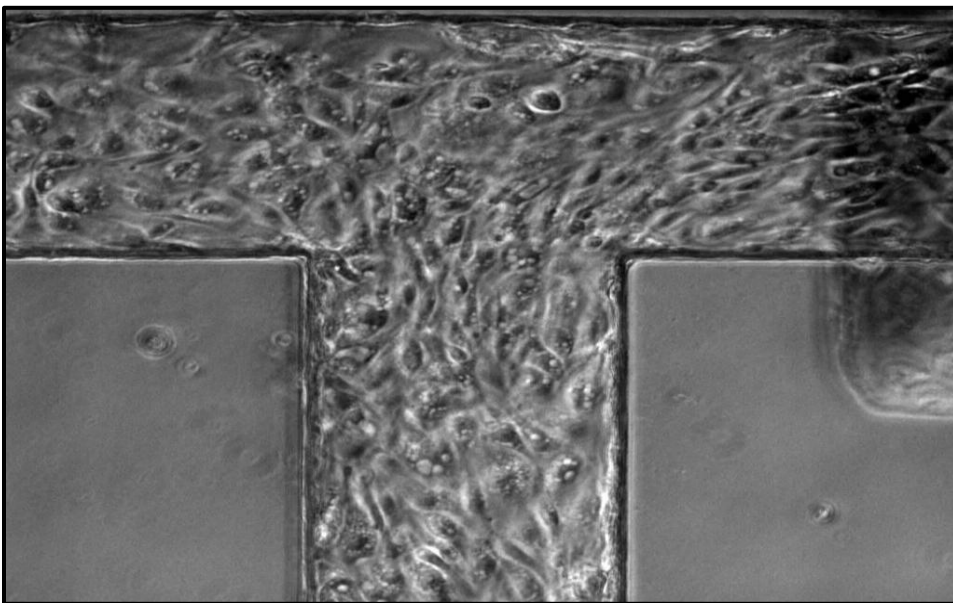
Supplementary Figures



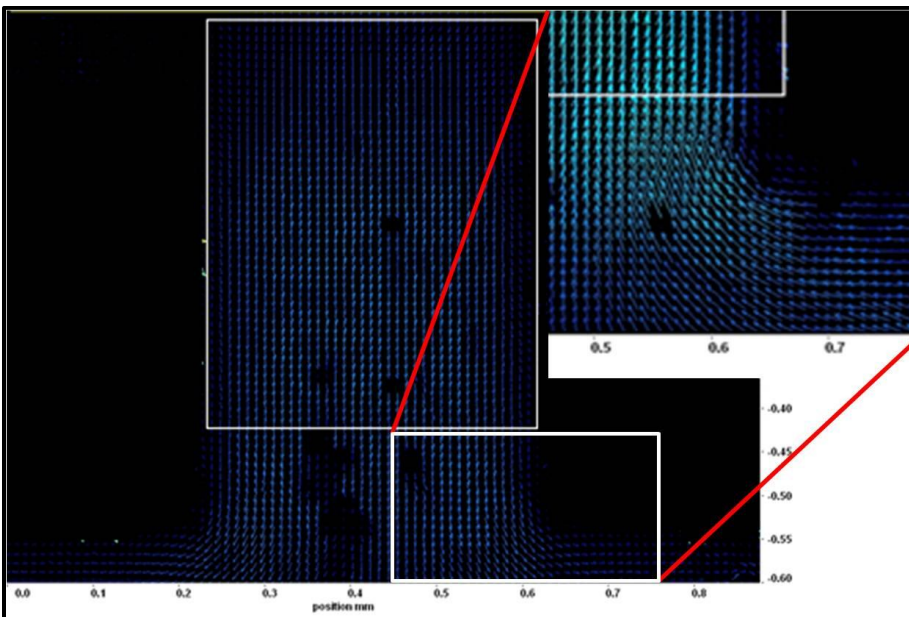
Supplementary Figure 1. Flow cell after 48 hours pulsatile shear flow showing an increased number of clustered cells elongated and sharing a similar orientation, however cluster orientation is not along the direction of flow.



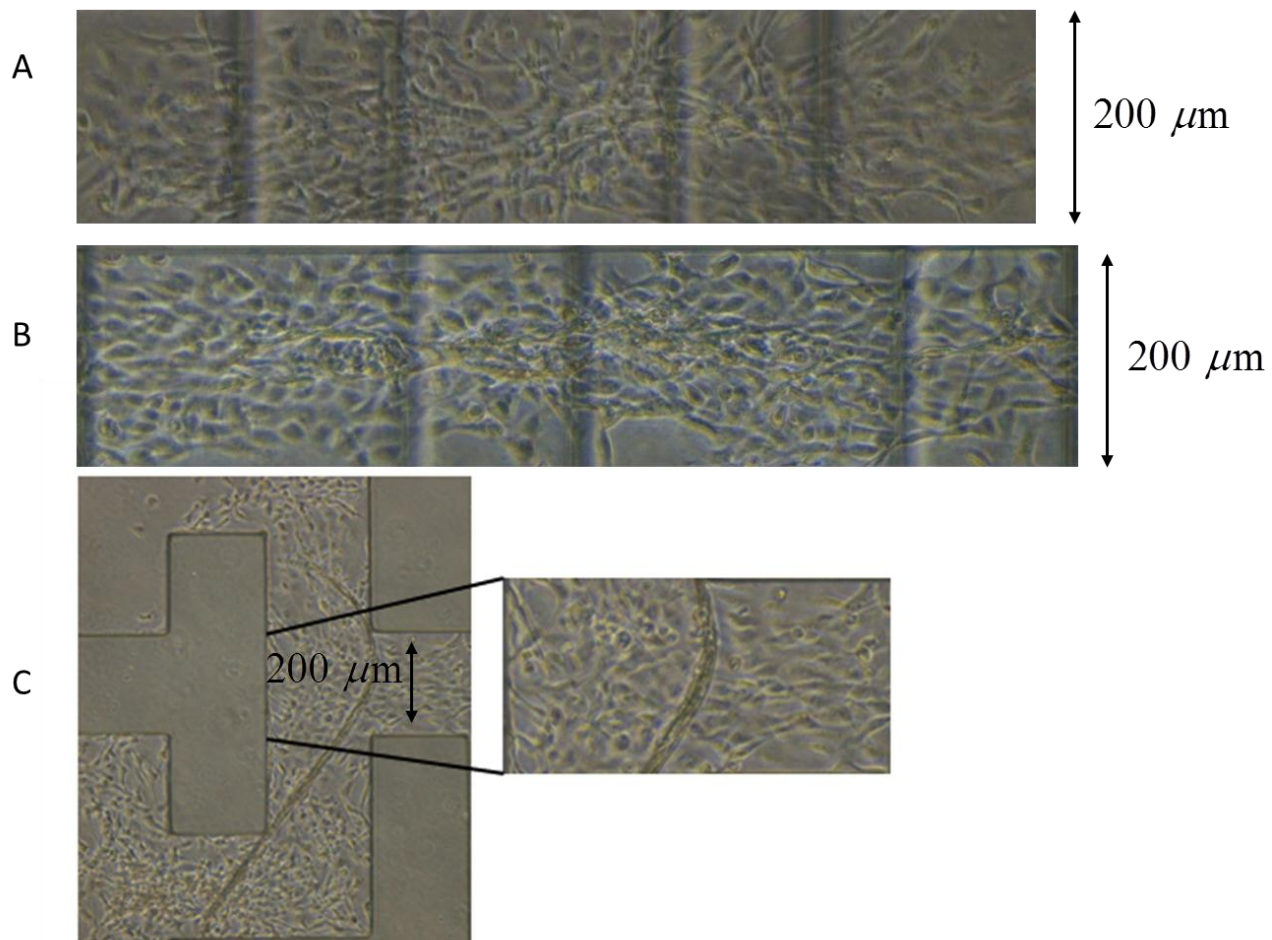
Supplementary Figure 2 Flow cell after 48 hours pulsatile shear flow near the inlet showing an increased number of clustered cells elongated and sharing a similar orientation along the direction of flow.



Supplementary Figure 3 Alignment of EC with flow direction near valve 1 (10x)



Supplementary Figure 4. μ -PIV velocity vector plot at the location of valve 1 on the inside of the ventricle



Supplementary Figure 5 Day 6 static controls showing BAEC morphology inside 200 μm channels. A and B. Parallel 200 μm channel inside ventricle (flow channel is horizontal, vertical channels are pneumatic control) C. Branching network