Supplementary Materials

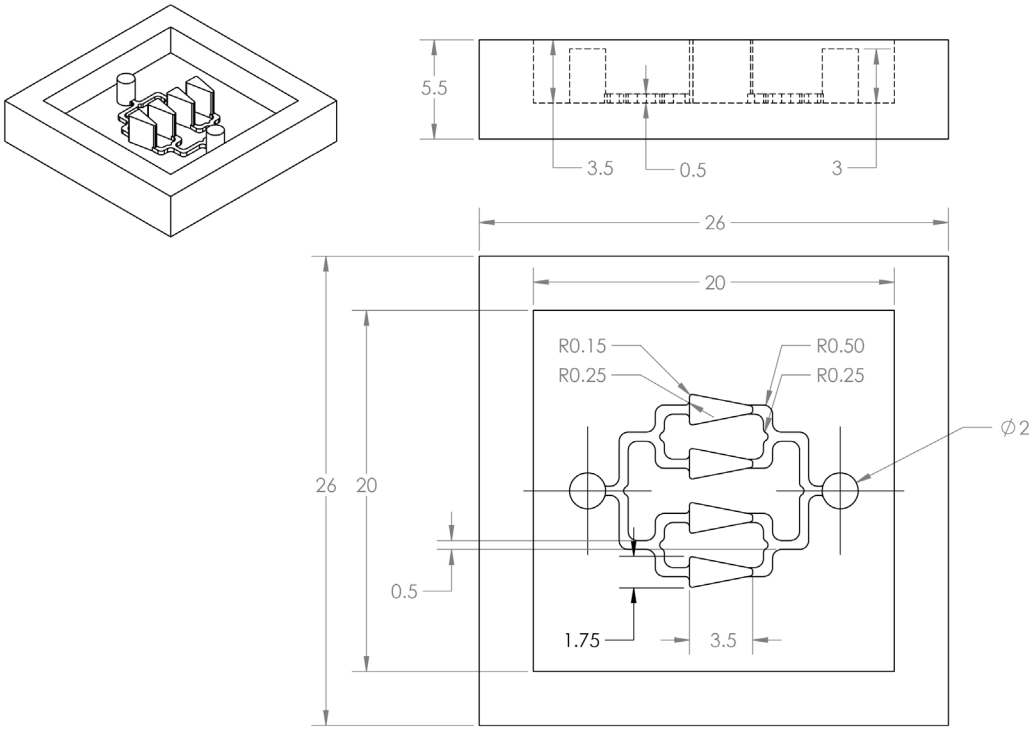

Fig. S1. Technical drawing of the template for the fluidic device. CAD file of the design that was milled into polycarbonate, which was the used as a template for molding the PDMS slab. All dimensions are mm.

Movie S1: Freshly isolated heart from *fli1a:GFP* adult zebrafish beating within the fluidic device. To assess the ability to fluorescently image hearts, we used a heart expressing the *fli1a:GFP* transgenic marker that labels endothelial cells. The coronary vessels are both readily visible on the surface of the ventricle and it was possible to image while culturing the beating heart on the microscope stage. Time in seconds is indicated on the bottom left. Scale bar is 200 μm.

Movie S2: Revascularization of the wound site after resection of the ventricle apex six days post-amputation. Live imaging of whole regenerating adult transgenic zebrafish heart (as shown in Fig. 5) expressing the pan-endothelial marker *fli1a:GFP* (magenta) and arterially restricted *flt1^{enh}:tdTomato* (cyan). *fli1a:GFP*-expressing endothelial cells are observed to migrate into the wound-site directly from proximal vasculature between six and ten days post-amputation. A subset of these endothelial cells also express *flt1^{enh}:tdTomato* and populate the wound site simultaneously with non-*flt1^{enh}* expressing endothelial cells. Time in hours is indicated on the bottom right. Scale bar is 100 μm.