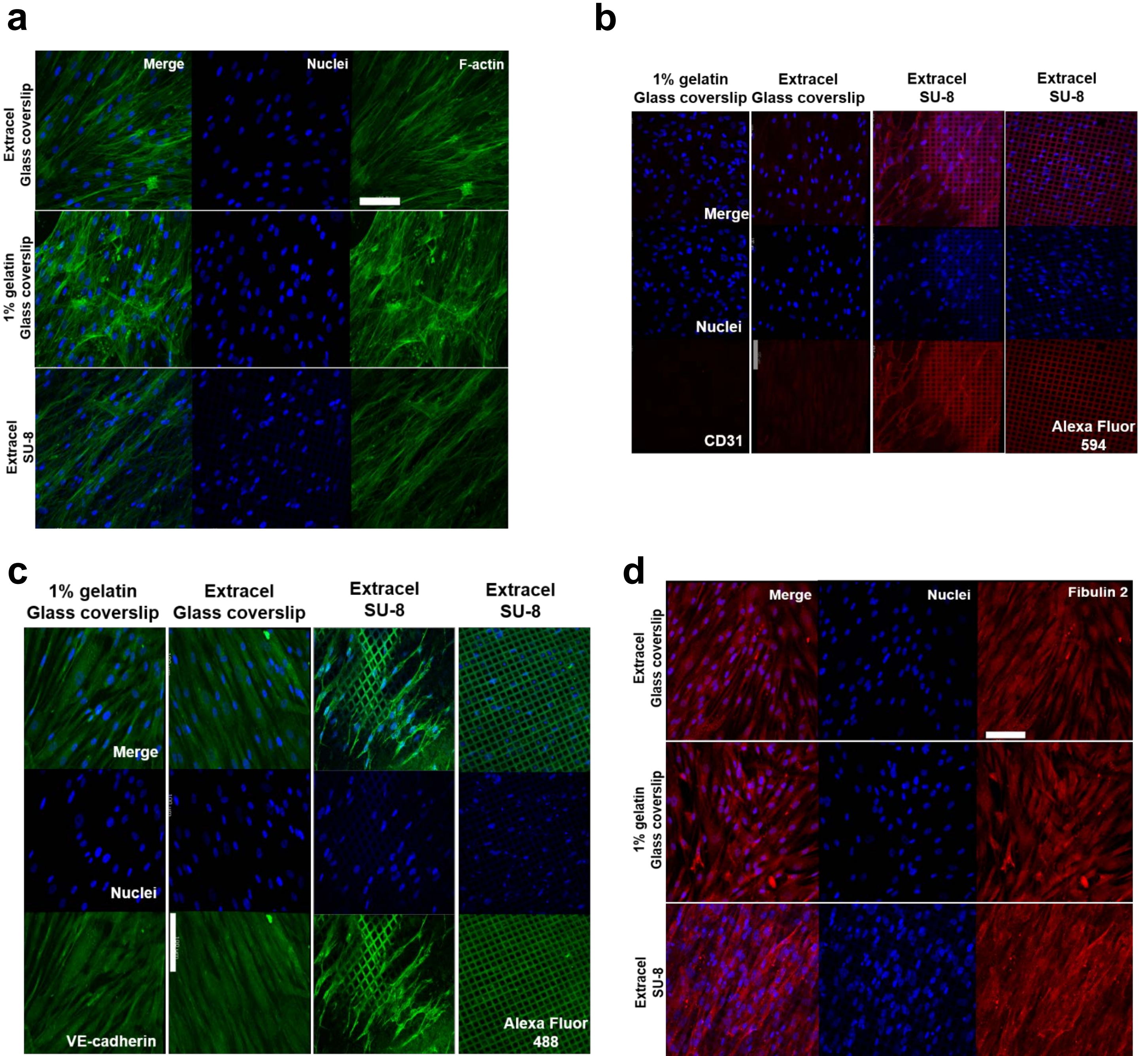
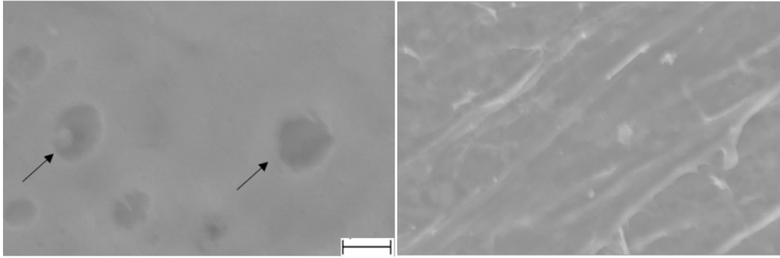
S1: Characterization of HSC cell development on ESU-8 (12-μm pore) scaffolds. (**a**) F-actin staining revealing fiber alignment of the HSC cells on the Extracel-coated SU-8 scaffold (ESU-8). (**b**) HSC cells cultured on the ESU-8 scaffold regained expression of cell characteristic marker, CD31, an expression that is lost in 2D culture on glass coverslips. (**c**) HSC cells cultured on the ESU-8 scaffold exhibited proper expression and distribution of cell characteristic marker, VE-cadherin, when compared to 2D culture on glass coverslip. (**d**) HSC cells cultured on the ESU-8 scaffold maintained expression of cell characteristic marker, fibulin 2. (a-d) Scale bar = 100 μm. (**e**) SEM images revealing formation of vacuole-like micron-sized pores in the engineered SC inner wall following perfusion at 4 μl/ min for 6 hours.



e

Perfused at 4 µl/min **No perfusion**



S2: Evaluation of the engineered Schlemm's canal inner wall as a model for drug. (**a, b**) Confocal images of engineered SC layer revealing induced fibronection expression (a) and increased stress fiber formation after treated with 1.4 and 2.5 ng/ml TGF-β2. Scale bar = 100 µm. (**c**) Gene expression of the engineered SC layer after treated with 2.5 ng/ml TGF-β2 revealing down-regulated VE-cadherin by immunocytochemistry. Scale bar = 100 µm (**d**) immunohistochemistry demonstrating a less than 1% transfection efficiency in the primary HSC cells 72 hours post-transfection with GFP. Scale bar= 400 nm