Abstract

Vascular-like tissues composed of cells maintaining their shape and structure at any position in a culture dish without the use of gels or other artificial materials are ideal vascular models to test the effects of candidate drugs on cells without adsorption by artificial materials and analysis of structural changes over time. In this study, we aimed to prepare fiber-shaped cell aggregates composed of human umbilical vein endothelial and mesenchymal stem cells as vascular pericytes anchored to the bottom of culture dishes at a defined location using our developed cell self-aggregation technique and dumbbell-shaped culture groove. The fiber-shaped cell aggregates maintained their shape for at least two weeks without rupture, and histological analysis revealed that they formed a unique tissue structure with a gapless endothelial layer on the outer surface and capillary-like structures oriented in the same direction as the long axis of the fiber in the medial side. Moreover, exposure to cadmium chloride, a vascular toxicant, elicited toxic responses in vascular endothelialized fiber-shaped tissues, with only their outer endothelial layer being disintegrated but their fiber shape remaining intact. Overall, our results suggest the developed vascular endothelialized fiber-shaped tissue construct as potential models for vascular toxicity testing, facilitating the evaluation of toxicity over time without any effects of gel adsorption.