Paper Title: Development of an arterial poly(vinyl alcohol) hydrogel model with lumen surface topography that mimics atherosclerosis feeling

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Abstract

Currently, there is a need to develop an arterial biomodel that mimics the feeling of catheter manipulation in disease to enable the evaluation of medical devices and the training of future surgeons. However, the feeling of catheter manipulation is tacit knowledge that is understood only by skilled surgeons and has not been clarified with an engineering parameter. This study focused on atherosclerosis and developed an arterial biomodel with a surface roughness of 17- 200 µm in the arterial lumen by combining 3D printing (which can fabricate fine roughness) and poly (vinyl alcohol) hydrogel (which has a high transfer capability). To evaluate the difference in the feeling of catheter manipulation due to variable surface roughness of the lumen, a sensory test was conducted on three supervisors of the Japanese Society for Neuroendovascular Therapy. Their evaluation of atherosclerosis progression and surface snagging depended on the surface roughness. There was a strong correlation between these two evaluations ($r2 = 0.91$), suggesting that surface roughness is one of the engineering parameters that reproduce the feeling of catheter manipulation in atherosclerotic vessels.