Does increasing the length of stent-graft augment the arterial stiffness?

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Objective: Elasticity is a fundamental property of the human aorta as it helps the aorta maintain blood pressure and blood flow at a stable rate. Endovascular aortic repair (EVAR) - one of the most common treatment strategies for aortic pathology - can lead to increased arterial stiffness and decreased elasticity, which has been linked to cardiovascular problems. While there is some understanding of factors that affect aortic stiffness, more research is needed to investigate the specific impact of stent-graft length on this process. The objective of this study was twofold: first, to develop a mechanically tuned human mock silicone aorta embedded into a custom-made mock flow loop replicating human blood circulation in vitro, and second, to evaluate how different length of commercial stent grafts impacts the quantification of hemodynamics, particularly pulse pressure. **Materials and methods**: Six mock silicone aorta were manufactured and embedded into the mock loop. The simulated heart rate and system flow rate were set to 60 bpm and 2.5L/min, respectively, to mimic the aorta's normal resting conditions. Inlet and outlet pressures were recorded using two pressure transducers at the proximal and distal sites of the silicone aorta. A 40mm stent graft was implanted into the silicone aorta and then was extended to 80mm by adding one more stent graft. Pressure and flow data were recorded at all three steps. **Results**: Systolic and diastolic pressures at the model inlet were set to 120mmHg and 80mmHg by tuning the mock loop afterload adjustments system in the baseline condition. The pulse pressure was calculated for the baseline, 40mm, and 80mm stent-grafts conditions. Our results showed that increasing the length of the stent-graft will elevate the pulse pressure (55.94 ± 2.31; 80mm SG vs. 52.24 ± 2.14; 40mm SG vs. 49.98 ± 1.73; baseline). **Conclusion**: Increasing the length of the stent graft adversely affects the pulse pressure, which is a marker of cardiovascular risk and a predictor of cardiovascular events.