Aortic cross-clamping (CC’ing) remains a frequently needed, unavoidable aortic manipulation maneuver in a number of different cardiovascular surgical applications. Despite certain advantages over other occlusion techniques, using CC comes at a price of inflicting substantial damage to the aorta — especially critical in the proximity of the CC’ed pinching sites, aggravated further in the presence of atherosclerotic lesions. Aiming to reduce such damage, a novel method of occluding an aorta is developed and investigated, namely pinchless CC (PCC). Three porcine aortic segments were CC’ed in vitro with various combinations of aluminum inserts (1.4 mm thick, different lengths, approximate CC surface width) and a negligibly thin guide for positioning the inserts on the inner CC surface. Results demonstrates a previously undocumented order in which regions of the aortic lumen comes into self-contact and consequently leads to the occlusion of the aorta during standard CC. Exploiting this phenomenon, the attainability of PCC is demonstrated: Occlusion can be achieved when using an insert that is shorter than the lateral flat pressed length of the inner luminal surface of the aorta. Thereby, pinching of the aortic wall can be prevented or at least minimized, which yields a number of clinically desirable
properties for improving CC. Some practical aspects need to be addressed prior to its foreseeable clinical implementation.