A Novel Aortic Cannula to Reduce Intraoperative Embolic Events- In- Vitro Results

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Objective:Patients who undergo myocardial revascularization procedures are susceptible to stroke. Up to 60% of intraoperative cerebral events are caused by emboli generated by manipulations of the aorta during surgery. The purpose of this In-Vitro study was to evaluate the efficacy of a novel aortic cannula. The cannula is designed to produce simultaneous forward flow and backward suction in order to extract from the distal aorta solid and gaseous emboli that are being released during cardiac surgery.

Methods: In-Vitro study was carried out on a 24F novel aortic cannula designed to capture and reduce intraoperative embolic events in patients undergoing cardiac surgery using a heart and lung machine. A model of a silicon aorta with four exits in a closed loop flow was established. To simulate emboli, osseous particles of different sizes were injected to the proximal aorta. An external filter was located on the suction tube in order to evaluate the amount of solid emboli caught by the cannula. Filters were placed at every exit as well.
Emboli were injected in three conditions: steady high net flow, Time dependent simulating transfer to low flow and manipulation phase at a low net flow. Cannula was compared to two standard 24F commercial cannulae. Total average of particles injected at every trial was 120 mg.

Results: At steady high net flow of 4 Liter/min and suction of 0.5 L/min the novel cannula retrieved 64.20± 9.3 mg (53.50%±7.77). At time dependent conditions, simulating transfer of 1 to 4.5 L/min net flow, the novel cannula retrieved 92.20 ±7.13 mg (76.84%±5.94), p= 0.00001. At manipulation conditions of 1 L/min net flow suction of 0.5 L/min the novel cannula retrieved 105.35± 3.90 (87.80±3.25%), p= 0.00001.

Conclusions: This study demonstrated the efficacy of a novel aortic cannula in capturing intraoperative emboli. Emboli extraction correlated with differen flow and suction regimens. This novel technology should be further validated in vivo and in human trials.