Interactive Cardio-Vascular and Thoracic Surgery
ISSN 1568-9293 Vol. 8, Suppl.1, April 15 2009, Page S54

CSF2-1

SELF-EXPANDING ARTERIAL CANNULA FOR CARDIOPULMONARY BYPASS: HEMODYNAMIC PERFORMANCE IN AN ANIMAL MODEL

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Objective: Small arterial cannulas for peripheral cardiopulmonary bypass are frequently related to high pressure in the circulatory system. Despite several improvement over the last ten years, the peripheral arterial cannulas did not changed in their main concept. Shear-induced haemolysis in the arterial lines under high pressure and high flow can be avoided using a new-shape cannula. Aim of this study is to compare the hemodynamic parameters coming from a standard peripheral arterial cannula and from the arterial self-expanding Smartcanula™ (Smartcanula LLC, Lausanne, Switzerland).

Methods: Three consecutive calves underwent general anesthesia, intubation and peripheral cannulation with a standard cardiopulmonary bypass circuit (3/8-1/2 PVC tubing). Hemodynamic parameters were monitorized via a femoral central venous catheter and an arterial femoral catheter. After general heparinisation (3 mg/kg), a 15 french (F) standard arterial cannula (NovaPort, Novalung® GMbH, Talheim, Germany) and an arterial self-expanding Smartcanula™ were inserted into the carotid artery after cervicotomy. The Smartcanula™ size was constricted to 15F to be comparable to the standard one. Hemodynamics were compared under different pump flows.

Results: Three animals were cannulated successfully with the standard arterial cannula and with the Smartcanula. The mean bodyweight was 61.7±1.5 kg and the mean body surface area was 1.39±0.1 m^2. The mean calculated target pump flow was 3.30±0.1 l/min. Under CPB, cannulas were tested for different pump flows: from 1 to 6 l/min. Measurements were compared: despite an equalisation of the arterial pressures from 1 to 3 l/min, the Smartcanula™ pressure is lower under high pump flow (284 mmHg vs. 349 mmHg, respectively, at 5 l/min, $P<0.005$ and 370 mmHg vs. 448 mmHg, respectively, at 6 l/min, $P<0.005$).

Conclusions: Self-expanding arterial cannula guarantees good results under standard CPB flows. Moreover, the mean arterial line pressures reached under high flows (4-6 l/min) are lower than mean arterial line pressures reached using a standard rigid arterial cannula. Despite more studies are mandatory, the results coming from this study are satisfactory.

VOL. 8 SUPPL. 1 APRIL 15 2009 ISSN 1569-9293 8(SUPPL. 1) S1-S130 (2009)

Interactive CardioVascular and Thoracic Surgery

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