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TB-RH- The Bossy Right Heart: concept and therapeutic approach in acute hemodynamic shock

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Background: Right heart contains natural stock of blood and endothelium that could be served as a physiological backup in case of hemodynamic failure. Accordingly, we propose right heart circulatory assist devices (CAD) therapy in acute hemodynamic shock.

Materials and Methods: Prototypes of CAD were tested in acute hemodynamic shock piglet as follows (Table 1): intrapulmonary pulsatile catheter in acute myocardial infarction (MI) and pulmonary arterial hypertension (PAH) models. Pulsatile trouser tested in acute right ventricular failure (RVF) model. Management was started after 1 h of surgical procedures, for another1 h period. Devices were pulsated intermittently, for 20 min /1 h period and irrespective of heartbeat.

Results: Hemodynamics were significantly, improved with dropped pulmonary vascular resistances in the pulsatile groups compared to control (Tables 2).

Comments: Right heart dominates left heart and hemodynamic, most probably through pulmonary vascular resistances. An effective therapeutic approach for CVD and circulatory disorders management, compared to present methods. It consists of shear stress-mediated endothelial function applications with pulsatile CAD, adaptable for the right heart circuit's biophysics and physiopathology: a shear rate enhancement device (catheter) and flow rate/shear stress enhancement device (trouser). Devices synchronization with the cardiac cycle is unnecessary in case of heart failure.

Model	Surgical Procedure	Pulsatile CAD	Control
Acute MI	Permanent LAD ligation	Intrapulmonary catheter	Nitrates
Acute PAH	Ao-pulm shunt	Intrapulmonary catheter	Tadalafil
Acute RVF	Pulm valve avulsion	Pulsatile trouser	Adrenaline, IV fluid, Tadalafil

Table 1: Groups

	Pulsatile		Control	
Models	PVRI	CO	PVRI	CO
Acute MI	119±13	0.92±0.15	400±42	0.52±0.08
Acute PAH	85.8±42.12	0.56 ±0.26	478.6±192.91	0.54 ±0.11
Acute RVF	174±60	1±0.2	352±118	0.7±0.2

Groups: pulsatile (n=6) and control (n=6); PVRI: pulmonary vascular resistances index (dyne.sec/cm^{-5}.kg^{-1}); CO: cardiac output (L/min); LAD: left anterior descending coronary artery; Ao-pulm: aortico- pulmonary artery, $p<0.05$ (2 ways-ANOVA)*.

Table 2: Results*

Biography

Dr. Sayed Nour has completed his medical studies at the age of 24 years from Alexandria University Faculty of medicine and postgraduate studies in thoracic & cardiovascular surgery from Paris-V University School of Medicine. He is pediatric heart surgeon, medical researcher; Inventor of new cardiopulmonary & circulatory assist devices. Founder and RD Director of an international cardiovascular research organization. Current research centers: Laboratory of Biosurgical Research (Foundation Alain Carpentier) Paris – France. He is author of new hemodynamic theory (flow & rate), has written 3 theses, published original papers, and about 10 world patents of cardiac assist devices as well as given university lectures and abstracts presentations.