NITROGLYCERIN AND BRAIN SATURATION IN CARDIAC SURGERY

Dominique Piquette MD, André Y. Denault MD FRCPC, Pierre Couture MD FRCPC, Sylvain Bélisle MD FRCPC, Michel Pellerin MD FRCSC, Sylvie Lévesque MSc, Jean-Claude Tardif MD FRCPC

Departments of Anesthesiology, Cardiac Surgery and Cardiology, Montreal Heart Institute, 5000 Bélanger Street, Montreal, Quebec H1T 1C8

INTRODUCTION: Cardiopulmonary bypass (CPB) is known to cause a major inflammatory reaction responsible for organs dysfunction in the postoperative period. Ischemia-reperfusion episodes are probably largely implicated in a global endothelial dysfunction which may persist after the surgery. Intravenous nitroglycerin could prevent some of these mechanisms beyond its hemodynamic effects. Our hypothesis is that nitroglycerin is superior to placebo in maintaining cerebral saturation using near-infrared spectroscopy.

METHODS: A total of 30 patients with Parsonnet score ≥ 15 were randomly assigned to receive IV nitroglycerin (15 patients; initial dose of 0.5 $\mu\text{g/kg/min}$ after general anesthesia and 1 $\mu\text{g/kg/min}$ during CPB) or placebo (15 patients). The primary outcome was the difference between groups in the mean cerebral saturations during CPB.

RESULTS: During CPB, the mean ($\pm\text{SE}$) hemispheric cerebral saturations were the same in the nitroglycerin and the placebo groups, respectively $58\pm 7\%$ vs $56\pm 11\%$ ($p=0.66$) in the left and $55\pm 6\%$ vs $49\pm 12\%$ ($p=0.16$) in the right. The evolution in time was significantly different in the nitroglycerin compared to the placebo group. In the nitroglycerin group, the left cerebral saturation was unchanged before the drug perfusion, before the CPB and after the CPB ($54\pm 11\%$, $56\pm 13\%$, and $56\pm 7\%$), but in the placebo group they decreased after CPB ($63\pm 8\%$, $61\pm 11\%$, and $52\pm 14\%$; $p=0.006$). The same observations were made for the right cerebral saturations ($51\pm 8\%$, $53\pm 11\%$, $53\pm 7\%$ vs $59\pm 11\%$, $56\pm 14\%$, $46\pm 14\%$; $p=0.005$). More patients in the placebo group lowered their left and right saturations below a value equal to 75% of their baseline (left: 4 vs 1, $p=0.08$; right: 5 vs 2, $p=0.1$). No difference was observed between groups for all major hemodynamic parameters, but patients in nitroglycerin group received significantly more norepinephrine (1208 μg vs 546 μg , $p=0.04$).

CONCLUSIONS: Intravenous nitroglycerin administered before and during CPB prevents cerebral desaturation in high-risk cardiac surgical patients. Further studies are required to explore its value in a larger population with neurological outcomes.