

TITLE: Vasoactive Mediators and Human Cardiopulmonary Bypass

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INTRODUCTION: Plasma levels of endogeneous vasoactive mediators (renin, norepinephrine, epinephrine, thromboxane B₂, prostacyclin metabolite), which represent the 3 most vasoactive systems in man, were correlated with hemodynamic measurements and the temporal course of cardiopulmonary bypass (CPB) in an attempt to determine if 1) there is a relationship between hemodynamic parameters and vasoactive compounds in this situation and 2) CPB is related to the endogeneous concentrations of any of these mediators. Numerous studies have shown that the renin-catecholamine-prostaglandin systems (RCP) are closely interrelated and exert profound hemodynamic effects. Renal perfusion data, in particular, indicates prostacyclin and renin are directly related. However, the extent to which these interactions are present in man are unknown. This is the first reported study of RCP interaction in man.

METHODS: Eight adult cardiac surgical patients undergoing elective valve replacements or coronary artery bypass grafting were studied during the course of their anesthesia and surgery. Patients were anesthetized and underwent hypothermic cardiopulmonary bypass for either condition. Complete hemodynamic characteristics were monitored and serial blood samples were collected and immediately prepared for chemical analysis. Renin and catecholamine assays were carried out by standard radioenzymatic techniques. Thromboxane B₂ and prostacyclin metabolite were quantitated by radioimmunoassay. This study was conducted within the guidelines established by the human studies committee of the Massachusetts General Hospital.

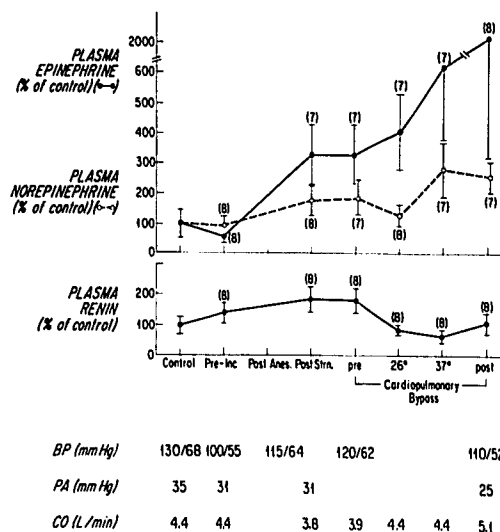


Fig. 1. Plasma catecholamines, renin, and hemodynamics during cardiac surgery.

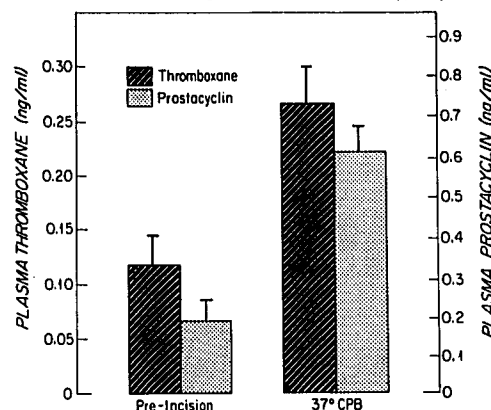


Fig. 2. Plasma thromboxane and prostacyclin levels during rewarming on cardiopulmonary bypass.

DISCUSSION: Our data suggest the stress of sternotomy and rewarming are reflected in elevated plasma catecholamine levels. Plasma renin is not. Both T and P increase during rewarming, and there is an increase in the normal P to T ratio. This suggests 1) changes in vasoactive substances can occur independently despite potential pharmacologic interaction, 2) prostaglandins and catecholamines increase without significant changes in plasma renin during rewarming, and 3) extrapolation of renal perfusion data to the intact human state may not be warranted.