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Use of oesophageal Doppler to guide fluid delivery in cardiac surgery reduces complications and reduces length of hospital stay

Mythen MG, Webb AR. *Peri-operative plasma volume expansion reduces the incidence of gut mucosal hypoperfusion during cardiac surgery.* Arch Surg 1995;130:423-29

Clinical Application: Intra-operative

This trial looked at the use of oesophageal Doppler monitor (ODM) to guide fluid delivery in patients undergoing coronary artery bypass surgery (CABG) or heart valve replacement.

Protocol Outline

60 patients undergoing cardiac surgery with an American Society of Anesthesiology (ASA) score of III and with well preserved left ventricular function (LVEF >50%) were included in the trial. The anaesthetist caring for the patient was blinded to the ODM readings.

All patients were subject to the same anaesthetic regime and monitored for gastric pHi (a pHi of <7.32 having been previously shown to be associated with an increased risk of post-operative complications), arterial blood pressure (ABP) and central venous pressure (CVP). The ODM probe was placed in all patients.

All patients were managed using standard post-operative care guidelines.

Patients in the group (T) were given 200ml boluses of hydroxyethyl starch (a colloid) to obtain maximum stroke volume (SV), as measured by ODM, and a rise in CVP of more than 3mm Hg. This procedure was repeated every 15 minutes until the end of surgery except when the patient underwent cardiopulmonary bypass.

Patients in the control group (C) were managed using standard practice with fluids delivered at the anaesthetist's discretion.

Results

T patients received 600ml more colloid and 300ml less crystalloid than C patients. T patients attained a higher SV and cardiac output, despite having a lower CVP. SV rose in the T group but fell in the C group (+15ml vs. -5ml; $p < 0.01$). Urinary output, blood pressure and heart rates did not differ between the two groups.

56% of patients in the C group, but only 6% in the T group, were shown to have a gastric pHi of <7.32. The T group had significantly fewer major complications (0 vs. 6, $p = 0.01$), significantly shorter length of hospital stay (6.4 vs. 10.1 days, $p = 0.011$) and a significantly shorter length of intensive care (ICU) stay (1 vs. 1.7 days, $p = 0.023$).

Commentary

This trial highlights a number of important points:

1. Traditional measures used to determine haemodynamic status (blood pressure, heart rate and urine output) are late and insensitive indicators of changes in circulating blood volume.
2. Use of the CardioQTM oesophageal Doppler monitor (ODM) to guide fluid delivery in this group of patients significantly reduced major complications, ICU stay and overall hospital stay.