

Title: DOES PREOPERATIVE EJECTION FRACTION PREDICT CVP/PCWP CORRELATION DURING AORTIC SURGERY?

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Previous investigators have concluded that, in unselected patients with heart or lung disease, pulmonary capillary wedge pressure (PCWP) is the only reliable clinical index of left ventricular filling during aortic surgery⁽¹⁾. Recently, however, Mangano found a close, and clinically useful, correlation between PCWP and central venous pressure (CVP) in patients, undergoing coronary artery bypass grafting (CABG), who had an angiographically determined ejection fraction greater than 0.5⁽²⁾. Therefore we designed a prospective study to determine whether ejection fraction as measured noninvasively by the gated cardiac scan could be used to isolate a subset of patients undergoing aortic surgery for whom CVP predicted PCWP.

Methods:

Sixteen patients undergoing aortic bifurcation grafting were studied with their informed consent and the approval of the University Clinical Investigation Committee. Preoperatively, ejection fraction was determined, and ventricular wall motion was assessed, using a gated cardiac scan.

Anesthesia was induced with fentanyl, diazepam, or thiopental, and maintained with nitrous oxide, enflurane, or halothane.

The heart rate, systolic, diastolic, and mean arterial pressures, PCWP, CVP, and cardiac output were recorded simultaneously three times during each of eight perioperative time periods: awake preoperatively; anesthetized before aortic cross-clamping; during the cross-clamp period; following release of the aortic cross-clamp; one, four, eight, and twenty-four hours postoperatively.

Simultaneous values of PCWP and CVP measured throughout the perioperative period for each individual patient were analyzed using linear regression analysis to determine both their correlation and the slope of the regression line between them. Again using linear regression analysis, the correlation between patients' preoperative ejection fraction and their: 1) preoperative PCWP, 2) preoperative cardiac index, and 3) both the correlation coefficient and slope of the regression line between their PCWP and CVP, were determined. $P < .05$ was considered statistically significant.

Results:

The entire patient population could be divided into two groups based on ventricular function as estimated by the gated cardiac scan. Seven patients had poor ventricular function as judged by an ejection fraction of < 0.5 or hypokinesis evident on the scan. The remaining nine patients had good ventricular function as judged by an ejection fraction > 0.5 and no evidence of hypokinesis. These two patient groups did not differ significantly in preoperative PCWP or preoperative cardiac index.

A significant correlation between CVP and PCWP was found for the entire patient population both for the entire duration of the study ($R = .68$, $P < .001$) and for each of 4 time periods: preoperative ($R = .71$, $P < .01$), before and after aortic cross-clamping ($R = .65$, $P < .01$), during aortic cross-clamping ($R = .68$, $P < .01$), and

postoperative ($R = .67$, $P < .01$). Further, statistically significant correlation between PCWP and CVP was found during the entire perioperative period for 14 of the 16 individual patients studied.

The slope of the regression line, or the sensitivity of the CVP in reflecting changes in PCWP, however, varied from .94 to -0.27 , and was greater than 0.5 in seven of the 16 patients. Further, there was no significant correlation ($r = 0.1$, $p > .7$) between the preoperative ejection fraction and the slope of the CVP/PCWP regression line for these patients (Figure). The preoperative ejection fraction, in addition, did not add precision to multivariate models based on preoperative history and physical data used to predict the perioperative correlation coefficient or slope of the CVP/PCWP regression in each patient.

Discussion:

Although PCWP is accepted as the only reliable clinical index of left ventricular filling in unselected patients with cardiovascular disease, the risk associated with the routine use of a Swan-Ganz catheter warrants attempts to select subgroups of patients for whom CVP would adequately reflect preload in the perioperative period. In Mangano's series of CABG patients, an angiographically-determined ejection fraction greater than 0.5 was associated with significant perioperative CVP/PCWP correlation, with the slope of the regression of CVP/PCWP $> .5$. Thus, ejection fraction appeared to select patients for whom Swan-Ganz monitoring was not necessary. In contrast, the ejection fraction as determined preoperatively by the gated cardiac scan in our patients undergoing aortic bifurcation grafting could not isolate such a patient subgroup. Therefore, caution must be used in applying Mangano's conclusions regarding angiographic ejection fraction in CABG patients to ejection fraction determined by the gated cardiac scan in other patient populations.

REFERENCES

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