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Special Feature

Does Central Venous Pressure Predict Fluid Responsiveness?*: A Systematic Review of the Literature and the Tale of Seven Mares

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Background

Central venous pressure (CVP) is used almost universally to guide fluid therapy in hospitalized patients. Both historical and recent data suggest that this approach may be flawed.

Objective

A systematic review of the literature to determine the following: (1) the relationship between CVP and blood volume, (2) the ability of CVP to predict fluid responsiveness, and (3) the ability of the change in CVP (Î”CVP) to predict fluid responsiveness.

Data sources

MEDLINE, Embase, Cochrane Register of Controlled Trials, and citation review of

relevant primary and review articles.

Study selection

Reported clinical trials that evaluated either the relationship between CVP and blood volume or reported the associated between CVP/Î”CVP and the change in stroke volume/cardiac index following a fluid challenge. From 213 articles screened, 24 studies met our inclusion criteria and were included for data extraction. The studies included human adult subjects, healthy control subjects, and ICU and operating room patients.

Data extraction

Data were abstracted on study design, study size, study setting, patient population, correlation coefficient between CVP and blood volume, correlation coefficient (or receive operator characteristic [ROC]) between CVP/Î”CVP and change in stroke index/cardiac index, percentage of patients who responded to a fluid challenge, and baseline CVP of the fluid responders and nonresponders. Metaanalytic techniques were used to pool data.

Data synthesis

The 24 studies included 803 patients; 5 studies compared CVP with measured circulating blood volume, while 19 studies determined the relationship between CVP/Î”CVP and change in cardiac performance following a fluid challenge. The pooled correlation coefficient between CVP and measured blood volume was 0.16 (95% confidence interval [CI], 0.03 to 0.28). Overall, 56 Â± 16% of the patients included in this review responded to a fluid challenge. The pooled correlation coefficient between baseline CVP and change in stroke index/cardiac index was 0.18 (95% CI, 0.08 to 0.28). The pooled area under the ROC curve was 0.56 (95% CI, 0.51 to 0.61). The pooled correlation between Î”CVP and change in stroke index/cardiac index was 0.11 (95% CI, 0.015 to 0.21). Baseline CVP was 8.7 Â± 2.32 mm Hg [mean Â± SD] in the responders as compared to 9.7 Â± 2.2 mm Hg in nonresponders (not significant).

Conclusions

This systematic review demonstrated a very poor relationship between CVP and blood volume as well as the inability of CVP/Î”CVP to predict the hemodynamic response to a fluid challenge. CVP should not be used to make clinical decisions regarding fluid management.

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Key words

anesthesia; blood volume; central venous pressure; fluid responsiveness; fluid therapy; hemodynamic monitoring; ICU; preload; stroke volume

Abbreviations

AUC, area under the curve; CI, confidence interval; CVP, central venous pressure; Î”CVP, change in central venous pressure; ROC, receiver operator characteristic

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