

Lithium dilution cardiac output measurement: a clinical assessment of central venous and peripheral venous indicator injection

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Objective: The lithium indicator dilution technique has been shown to measure cardiac output (CO) accurately by using central venous injection of lithium chloride (Li-CCO). This study aimed to compare the measurement of CO by using peripheral venous administration of lithium chloride (Li-PCO) with Li-CCO.

Design: Prospective, observational human study.

Setting: Surgical intensive care unit.

Patients: Thirty-one patients were studied after major surgery. All patients had arterial, central, and peripheral venous catheters. A total of 24 patients had pulmonary artery catheters.

Measurements: Serial measurements of Li-CCO and Li-PCO were made during hemodynamically stable conditions. CO was also measured using thermodilution (TDCO) when a pulmonary artery catheter was present. Data were analyzed by linear regression, the generalized estimating equation, and the comparison method described by Bland and Altman.

Main results: There were 93 Li-CCOs, 93 Li-PCOs, and 216 TDCOs recorded. The ranges of COs were similar: Li-CCO, 2.36-11.52 L/min (mean, 5.22 L/min; n = 31); Li-PCO, 1.63-9.99 L/min (mean, 5.22 L/min; n = 31), and TDCO, 3.28-10.4 L/min (mean, 5.75 L/min; n = 24). There was good linear correlation between Li-CCO and Li-PCO ($R^2 = .845$). The mean difference for Li-CCO-Li-PCO was very small and insignificant ($p = .97$), and the limits of agreement were acceptable (mean difference \pm sd, 0.0005 \pm 0.64 L/min). The mean difference for Li-CCO-Li-PCO was smaller if the peripheral injection site was proximal rather than distal to the wrist ($p = .053$). Li-PCO and Li-CCO values were lower than simultaneously obtained TDCO measurements (Li-PCO-TDCO, -0.538 ± 0.95 L/min, $p = .003$; Li-CCO-TDCO, -0.526 ± 0.67 L/min, $p = .0001$).

Conclusions: Li-PCO gives a measurement that agrees well with Li-CCO. Accuracy of Li-PCO is probably improved if a proximal arm vein is used. Li-PCO provides accurate measurements of CO without the risks of pulmonary artery or central venous catheterization.