B11

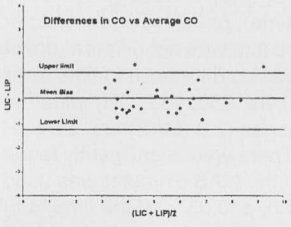
TITLE: Cardiac Output Measurement without Pulmonary Artery or Central Venous Catheterization: A Clinical Assessment of the Lithium Dilution Method

AUTHORS: Charles Garcia-Rodriguez, Cynthia Cassell, Christopher Young*, John Sum Ping* and Jonathan B Mark*.
AFFILIATION: Anesthesiology, DUMC, VAMC, Durham, NC, United States. 27710

Lithium dilution cardiac output monitoring (LiDCO Ltd, London, UK) is a new technique that measures cardiac output (CO) without need for pulmonary artery catheterization.[1] This method requires central venous administration of lithium chloride and a lithium-sensitive electrode attached to an arterial catheter to construct a lithium dilution curve from which CO is calculated. The aim of this study was to investigate the accuracy of the lithium dilution method of CO measurement using peripheral administration of lithium (LiP) compared to central venous administration of lithium (LiC). If LiP provides an equally accurate CO measurement, this technique would allow CO measurement using only peripheral venous and arterial cannulation.

Following IRB approval and patient consent, 29 patients were studied in the intensive care unit immediately following major surgery to compare sets of CO measurement. Using central and peripheral injection of lithium, three sets of paired measurement of cardiac output were made for each patient.

Analysis using the general estimating equation showed no significant difference between average CO measurement performed by LiC versus LiP (p= 0.62). The mean CO was calculated for each technique for each patient, then the difference between measurement techniques was plotted against the mean value [2] to determine bias 0.004l/min (mean difference) and limits of agreement +/- 1.24l/min (+/- 2 SD).



The absence of any bias between LiP and LiC suggests that there is no significant loss of lithium indicator when administered peripherally. Our results suggest that in patients with only peripheral venous and arterial cannulation, LiP provides measurement of CO within clinically acceptable limits of agreement[3], without the necessity for central venous access and the associated risks.

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1. BJA 1993;71(2):262-6.
2. Lancet 1986;1(8476):307-10.
3. J Clin Monit 1999;15:85-91.

B12

TITLE: GASTROINTESTINAL COMPLICATIONS AFTER CARDIOPULMONARY BYPASS

AUTHORS: C. Byhahn MD, S. Kessler MD, V. Lischke V, S. Halbig MD, K. Westphal MD, S. Mierdl MD
AFFILIATION: Dept. of Anesthesiology, J.W. Goethe-University, D-60590 Frankfurt, Germany

Objective: Despite major advances in cardiopulmonary bypass technology and improved strategies in intensive care medicine, the 1-3% incidence of gastrointestinal complications (GIC) after cardiopulmonary bypass remained constant during the last two decades (1, 2). Once GIC occur after cardiac surgery, lethality is high. Due to the absence of early specific clinical signs, diagnosis is often delayed. The present study seeks to determine predictive risk factors for subsequent gastrointestinal complications after cardiosurgical procedures.

Methods: Within a one-year period, a total of 1,116 patients who had undergone open heart surgery with cardiopulmonary bypass were prospectively studied for gastrointestinal complications. To determine predictive factors, all case histories of the patients were analyzed.

Results: 23 (2.1%) of the 1,116 patients had GIC during the postoperative period. 10 of whom had to undergo subsequent abdominal surgery. Of these 23 patients, 20 patients died (Table 1).

Table 1: Gastrointestinal complication	Pat. (n)	Survivors (n)	Onset (days post-OP)
Hepatic failure	5	0	6 (3 – 8)
Mesenteric ischemia	5	1	7 (1 – 11)
Gastric bleeding	7	1	13 (9 – 20)
Pseudomembraneous colitis	3	0	27 (8 – 40)
Cholecystitis	2	1	45 (30 – 60)
Septic rupture of the spleen	1	0	43

Data are numbers or medians and (range)

The likelihood of GIC after cardiopulmonary bypass was highly increased in association with a number of factors as shown in Table 2. Furthermore, both cardiopulmonary bypass and aortic clamping times were significantly prolonged in patients who developed GIC.

Table 2: Risk factors for gastrointestinal complications (GIC)	No GIC (n=1.093)	GIC (n=23)	p value
Postop. low cardiac output	49 (4,5%)	13 (56,5%)	<0,0001
Postop. onset of atrial fibrillation	119 (10,9%)	16 (69,6%)	<0,0001
Emergency surgery	91 (8,3%)	12 (52,2%)	<0,0001
Postop. vasopressor support	97 (8,9%)	12 (52,2%)	<0,0001
Aortic balloon pump required postop.	30 (2,7%)	5 (21,7%)	0,0005
Redo thoracotomy < 24h	39 (3,6%)	6 (26,1%)	0,0002
Preex. serum creatinine > 2mg/dl	60 (5,5%)	5 (21,7%)	0,0085
Preex. COPD	129 (11,8%)	6 (26,1%)	0,0495

Data are numbers and (%)

Conclusions: The results of our study show that a number of postoperative complications are associated with a highly increased risk for the development of gastrointestinal complications after cardiac surgery. Intestinal hypoperfusion as a result of poor cardiac output is likely to result in hepatic failure and ischemic bowel disease early after surgery. Gastric bleeding, cholecystitis, and pseudomembraneous colitis are late complications and are probably sequelae of prolonged ICU treatment. The risk factors described allow to predict who is at increased risk for gastrointestinal complications. Knowledge of these factors and increased awareness of patients at risk may lead to more timely diagnosis, earlier therapeutic intervention and therefore a reduction of the alarmingly high mortality rate of gastrointestinal complications, at least in patients whose gastrointestinal complications are not sequelae of prolonged poor cardiac function and subsequent intestinal hypoperfusion.

References: (1): Hanks et al., Surgery 1982;92:394
(2): Simic et al., Cardiovasc Surg 1999;7:419