

RESEARCH ARTICLE

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# Accuracy of an autocalibrated pulse contour analysis in cardiac surgery patients: a bi-center clinical trial

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## Abstract

**Background:** Less-invasive and easy to install monitoring systems for continuous estimation of cardiac index (CI) have gained increasing interest, especially in cardiac surgery patients who often exhibit abrupt haemodynamic changes. The aim of the present study was to compare the accuracy of CI by a new semi-invasive monitoring system with transpulmonary thermodilution before and after cardiopulmonary bypass (CPB).

**Methods:** Sixty-five patients (41 Germany, 24 Spain) scheduled for elective coronary surgery were studied before and after CPB, respectively. Measurements included CI obtained by transpulmonary thermodilution (CI<sub>TTPD</sub>) and autocalibrated semi-invasive pulse contour analysis (CI<sub>PCA</sub>). Percentage changes of CI were also calculated.

**Results:** There was only a poor correlation between CI<sub>TTPD</sub> and CI<sub>PCA</sub> both before ( $r^2 = 0.34$ ,  $p < 0.0001$ ) and after ( $r^2 = 0.31$ ,  $p < 0.0001$ ) CPB, with a percentage error (PE) of 62 and 49 %, respectively. Four quadrant plots revealed a concordance rate over 50 % indicating an acceptable correlation of trends between CI<sub>TTPD</sub> and CI<sub>PCA</sub> before (concordance: 93 %) and after (concordance: 94 %) CPB. In contrast, polar plot analysis showed poor trending before and an acceptable trending ability of changes in CI after CPB.

**Conclusions:** Semi-invasive CI by autocalibrated pulse contour analysis showed a poor ability to estimate CI compared with transpulmonary thermodilution. Furthermore, the new semi-invasive device revealed an acceptable trending ability for haemodynamic changes only after CPB.

**Trial registration:** ClinicalTrials.gov; NCT02312505 Date: 12.03.2012

**Keywords:** Cardiac index, Pulse contour analysis, Haemodynamic monitoring, Transpulmonary thermodilution

## Background

Most of the studies applying algorithms for haemodynamic optimization of high-risk surgical patients have used cardiac index (CI) as one important target. Furthermore, these investigations could demonstrate that optimization of CI was associated with a significant lower rate of postoperative morbidity and mortality [1]. In the past, estimation of CI was mostly performed by pulmonary or transpulmonary thermodilution (TTPD) which due to their invasiveness are

associated with considerable complications [2–4]. Therefore, interest has focused on less-invasive, readily available and easy to install techniques which are based for example on continuous arterial waveform analysis [5–7]. By using established arterial catheters, pulse contour analysis offers the opportunity for continuous estimation of CI and other haemodynamic variables like systemic vascular resistance or stroke volume variation, enabling the clinician to respond quickly and effectively to abrupt haemodynamic changes. The recently introduced semi-invasive monitoring system Pulsioflex (Pulsion Medical Systems, Munich, Germany) was developed for continuous CI trending and consists of an algorithm that provides beat-to-beat estimation of CI by analysis of the arterial blood pressure tracing. By using a proprietary “autocalibration” mode this software

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# Accuracy Autocalibrated Contour Analysis Patients

**R Barnett**



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In an era characterized by interconnectedness and an insatiable thirst for knowledge, the captivating potential of verbal expression has emerged as a formidable force. Its ability to evoke sentiments, stimulate introspection, and incite profound transformations is genuinely awe-inspiring. Within the pages of "**Accuracy Autocalibrated Contour Analysis Patients**," a mesmerizing literary creation penned by a celebrated wordsmith, readers attempt an enlightening odyssey, unraveling the intricate significance of language and its enduring effect on our lives. In this appraisal, we shall explore the book's central themes, evaluate its distinctive writing style, and gauge its pervasive influence on the hearts and minds of its readership.

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