EVALUATION OF A NEW MONITOR FOR MEASUREMENT OF PROPOFOL CONCENTRATIONS DURING CARDIAC SURGERY

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Introduction: We describe the performance of a propofol analyzer during cardiac surgery which is more than adequate to support development into a point-of-care, in vitro diagnostic device.

Current methods for the measurement of whole blood propofol concentrations require complex extraction and analysis techniques unsuitable for use at the point of care. We present the results from a monitoring system which combines sample preparation, extraction and detection into one instrument. 0.5ml of whole heparinised blood is mixed with 1ml of distilled water and injected into the instrument. Propofol is removed from the lysed blood using a solid phase extraction medium. The extract is then mixed with Gibbs reagent to produce a colour change indicative of the propofol concentration. The colour change is measured using ultra violet absorption spectroscopy, results are displayed on a laptop PC screen. The instrument has a measurement cycle time of approximately 3 minutes. A reference method for whole blood analysis was also developed using acetonitrile extraction and High Performance Liquid Chromatography (HPLC).

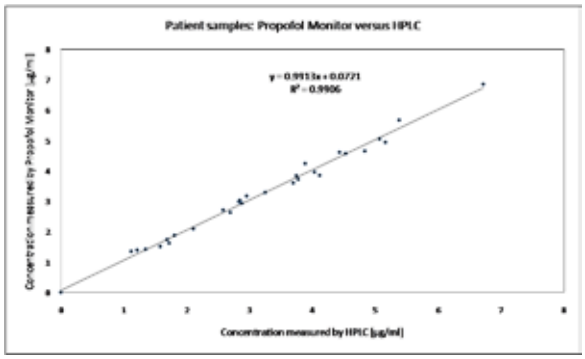

Figure 1

Method: Following Research Ethics Committee approval and previous evaluation of the instrument in spiked blood samples, waste blood gas samples were collected from patients undergoing cardiac surgery. All patients were receiving intravenous propofol as part of their anaesthesia, some as part of a total intravenous technique, others in combination with inhaled isoflurane or sevoflurane. The volume of blood left after routine blood gas estimation is approximately 1.5mls, this was sufficient for paired analysis on the research instrument and with HPLC. In a separate experiment we spiked heparinised volunteer blood with propofol to a calculated concentration of 8 μg/ml. We then added the following drugs to a calculated concentration of approximately twice the maximum seen in clinical practice to test for interference: Epinephrine, norepinephrine, cefuroxime, furosemide, amiodarone, glyceryl trinitrate.

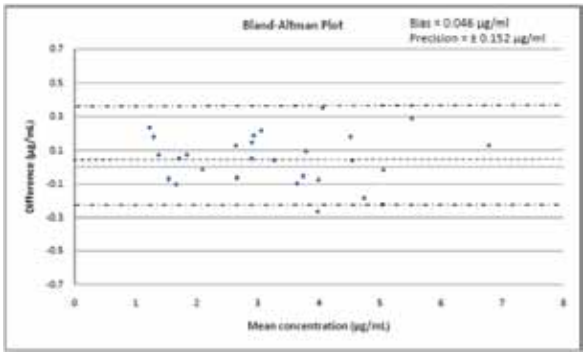

Figure 2

Results: 27 samples were collected from 11 patients. Figure 1 shows the results as a regression plot.

Figure 2 shows a Bland-Altman plot of the same data with lines drawn at the mean difference (bias) and 95% confidence intervals.

Having corrected for dilution effects we could not detect any interference from the drugs listed above.

Discussion: The results comparing the research instrument to HPLC showed excellent agreement and linearity with an R2 value of 0.9906, a bias of +0.05 g/ml and limits of agreement at the 95% confidence level of -0.25 g/ml to +0.34 g/ml. The lack of interference from commonly used drugs is encouraging. Further development of the instrument is planned and will result in a point-of-care in vitro diagnostic device allowing clinical staff to rapidly and accurately measure whole blood propofol concentrations during surgery and in critical care.

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