Level of agreement between Nexfin and thermodilution cardiac output in morbidly obese patients undergoing laparoscopic surgery

P. Schraverus¹, M. Kuijper¹, C. Boer¹, C. Boly¹, S. van Kralingen²

Departments of Anesthesiology¹, VU University Medical Center, Amsterdam,

Departments of Anesthesiology², Onze Lieve Vrouwe Gasthuis West, Amsterdam, The Netherlands

Introduction

Morbidly obese patients are at increased risk for intraoperative hemodynamic instability, which requires intensive monitoring. The non-invasive Nexfin® monitor is used to monitor cardiac output (CO), it is however unknown whether its weight-based algorithm also applies to patients with extreme bodyweight. Here we investigated agreement and trending ability of Nexfin CO measurements compared to thermodilution CO measurements of the PiCCO in morbidly obese patients.

Methods

We used the Nexfin and PiCCO thermodilution methods to measure CO in morbidly obese patients how underwent laparoscopic bariatric surgery on 12 consecutive pre determined time points.

Time point	Description
1	After induction of anaesthesia
2	After positioning, before pneumoperitoneum
3	After pneumoperitoneum
4, 5, 6, 7	15, 30, 45 and 60 minutes following pneumoperitoneum
8	Just before release of pneumoperitoneum
9	Immediately after release of pneumoperitoneum
10	Immediately after extubation
11,12	30 and 60 minutes following extubation

Results

Patient characteristics

Patient characteristic	
N	30
Age (years)	46 (11)
Females (%)	67
Body length (m)	1.7 (0.1)
Body weight (kg)	127 (21)
Body mass index (kg.m ⁻²)	44.6 (6.4)
ASA classification	2 (2-2)

Level of agreement – Bland Altman analysis

Bland Altman analysis corrected for multiple measurements revealed a bias of 0.60 (1.62) l.min⁻¹ with limits of agreement from -2.67 to 3.86 l.min⁻¹. The precision error was 46%.

Haemodynamic parameters during surgery

Course of the mean arterial pressure (MAP), heart rate (HR), stroke volume (SV) and cardiac output (CO) as measured by the Nexfin (blue circles) and thermodilution (white circles) during bariatric surgery.

Trending ability

Trending of cardiac output by the Nexfin device was insufficient when compared to thermodilution as shown by a four-quadrant and Polar plot analysis. The angular concordance rate was 77%. Polar plot analysis resulted in an angular bias of 2.61°, radial limits of agreement of -60.08° to 49.82°.

Conclusion

We found an unacceptable level of agreement and trending of cardiac output by the Nexfin compared to thermodilution in morbidly obese patients undergoing laparoscopic surgery according the Critchley criteria. Our data suggest that the Nexfin monitor should therefore not be used in patients with excessive body weight.