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Femoral indicator injection for transpulmonary thermodilution using the EV1000/VolumeView®: do the same criteria apply as for the PiCCO®?

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Background

- Usually transpulmonary thermodilution (TPTD) is performed by indicator injection using *jugular or subclavian* vein access.
- If superior vena cava access is not feasible, *femoral* access can be used.
- However, two recent studies demonstrated significant overestimation of global end-diastolic volume GEDVI in case of *femoral* injection:

  - Saugel B et al. *Crit Care* 2010;14(3): R95.
  - Schmidt S et al. *Crit Care Med* 2007;35(3):783-786.

Background II

- Based on a study using the PiCCO-device, Saugel, Huber et al. provided a correction formula for $GEDVI_{fem}$ based on data from 24 patients:

  $GEDVI_{fem\ corrected}$ [mL/m²] =

  $0{,}539 * GEDVI_{fem} - 15.17 + 24.49 * CI_{fem} + 2.311 * IBW$

  (IBW: Ideal bodyweight)

- While the above-mentioned study used the PiCCO-device, we report a case with comparison of GEDVI obtained by femoral and jugular transpulmonary thermodilution (TPTD)-indicator injection using the EV-1000®-device (Edwards, Irvine, USA).

Methods, Results I

- In a patient with both jugular as well as femoral vein access and monitored with the EV-1000/VolumeView®, we recorded 10 datasets with duplicate TPTD via femoral and via jugular access.
- Mean $GEDVI_{femoral}$ (674.6±52.3 mL/m^2) was significantly higher than $GEDVI_{jugular}$ (552.3±69.7 mL/m^2; p=0.003).
- Bland-Altman analysis demonstrated a bias of +122±61 mL/m^2, limits of agreement of -16 mL/m^2 and +260 mL/m^2 and a percentage error of 22%.
- Use of the correction-formula suggested for the PiCCO®-device significantly reduced the bias.

Results II

- Similarly, mean values of parameters derived from GEDV(I) such as pulmonary vascular permeability index (PVPI; 1.244±0.101 vs. 1.522±0.139; $p<0.001$) and global ejection fraction (GEF; 24.7±1.6 % vs. 28.1±1.8%; $p<0.001$) were significantly different in the case of femoral compared to jugular indicator injection.
- Furthermore, the mean cardiac index derived from femoral indicator injection $CI_{femoral}$ (4.5±0.36 L/min/m²) was higher than $CI_{jugular}$ (4.12±0.44 L/min/m²; $p=0.02$) resulting in a bias of +0.38±0.37 L/min/m² and a percentage error of 19.4%.

Conclusions

- Femoral access for indicator injection results in markedly altered values provided by the EV1000/VolumeView®, particularly for GEDVI, PVPI and GEF.
- Use of the correction-formula recently suggested for the PiCCO®-device significantly reduced bias and percentage error of GEDVI derived from femoral indicator injection also in the EV1000/VolumeView®.