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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 $\text{GEDVI}_{\text{fem}}$ based on data from 24 patients:

$\text{GEDVI}_{\text{fem corrected}} [\text{mL/m}^2] =$

$$0,539 * \text{GEDVI}_{\text{fem}} - 15.17 + 24.49 * \text{CI}_{\text{fem}} + 2.311 * \text{IBW}$$

(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 $\text{GEDVI}_{\text{femoral}}$ ($674.6 \pm 52.3 \text{ mL/m}^2$) was significantly higher than $\text{GEDVI}_{\text{jugular}}$ ($552.3 \pm 69.7 \text{ mL/m}^2$; $p=0.003$).
- Bland-Altman analysis demonstrated a bias of $+122 \pm 61 \text{ mL/m}^2$, limits of agreement of -16 mL/m^2 and $+260 \text{ mL/m}^2$ 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 $+0.38 \pm 0.37$ 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[®].