Journal of Cardiovascular Magnetic Resonance

Technologist presentation

Background offset error in pulmonary and aortic phase contrast flow imaging of 94 patients

Annette L Dahl*, Peter D Gatehouse and Philip J Kilner

Address: The Royal Brompton Hospital, London, UK
* Corresponding author

from 13th Annual SCMR Scientific Sessions
Phoenix, AZ, USA. 21-24 January 2010

Published: 21 January 2010

Journal of Cardiovascular Magnetic Resonance 2010, **12**(Suppl 1):T13 doi:10.1186/1532-429X-12-S1-T13

This abstract is available from: http://jcmr-online.com/content/12/S1/T13

Background

Velocity-encoding generates small eddy currents causing background offset errors (recognised as velocity of stationary tissue). Chernobelsky *et al*. (2007) assessed background offset correction on 10 volunteers, demonstrating that offset errors ≈1% of VENC can cause up to 25% errors during measurements. No larger studies have yet measured this error.

Methods

Patients were scanned at 1.5T (Siemens Avanto VB15, 12-channel phased-array coil) with a retrospectively ECG-gated, breath-hold flow sequence (turbo-factor 6, TR10/TE2.3ms, 698Hz/pixel, flip angle 25°, FOV 320-360mm, 1.3x2.5mm at 320mmFOV, 10mm SLT, Maxwell-correction, no other background-correction, VENC 80-420 (avg.175)cm/s). Oblique aortic and/or pulmonary flow studies in 94 patients were reproduced using a stationary jelly-phantom, with the exact imaging parameters used in-vivo including individual ECG simulations. Through-plane flow was calculated (CMRtools, CVIS) by outlining the cross-sectioned vessel and adding volume flow over the cardiac cycle. The region of interest was copied onto the phantom image to find the background offset in ml/beat. During each scan the couch moved automatically to zero the head-foot (z-) location; this should always have placed the vessel of interest at z=0 but residual head-foot vessel locations were recorded. Correlations between the background offset and relevant study parameters were tested.

Results and discussion

Aortic and pulmonary flows showed average absolute offsets of 2.2 ml/beat (n=87) and 3.9ml/beat (n=45), with largest absolute errors of 15 ml/beat and 26ml/beat (Figure 1). No significant correlation between background offset error and overestimated VENC or vessel cross-sectional area was found. A weak association of offset error with the residual head-foot location of the vessel was apparent, consistent with the experience at several centers that a transverse slice is preferable for flow, because it is then easier to ensure the vessel is at z=0. Careful consideration must also be taken when calculating phantom correction, as errors can be either subtracted or added onto vessel measurements, depending whether they are expressed as positive or negative values. Previous comparison of different MRI systems strongly suggests that this is not unique to the system and protocol used in this work. The clinical flow protocol evaluated in this work did not make full use of gradient performance.

Conclusion

In this protocol, uncorrected background offset error would have caused 10% or greater error in approximately 10% of the studies, degrading the reliability of large vessel flow, requiring careful consideration of correction methods.

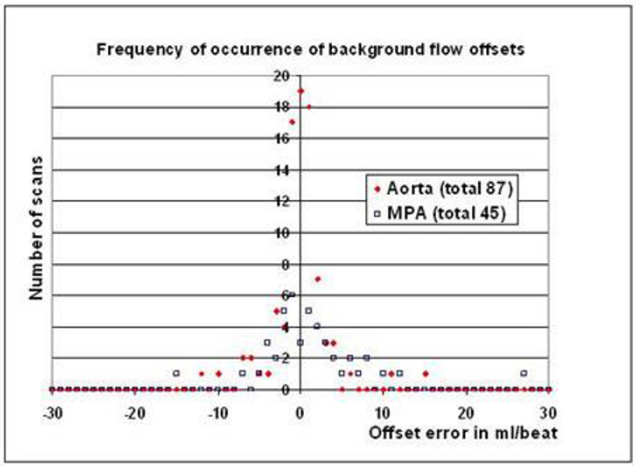

Figure 1