

WALKING POSTER PRESENTATION

Open Access

Impact of oxygen as a vasodilator on respirationrelated Gontan hemodynamics assessed by realtime phase-velocity MRI

Hermann Koerperich¹, Katja Müller², Peter Barth¹, Andreas Peterschröder¹, Jürgen Gieseke⁴, Deniz Kececioglu³, Wolfgang Burchert¹, Kai T Laser^{3*}

From 18th Annual SCMR Scientific Sessions Nice, France. 4-7 February 2015

Background

Inhalative administration of oxygen increases pulmonary blood flow by vasodilation. Currently, flow rate quantification using conventional two-dimensional phase-contrast MRI (PC-MRI) is not capable to study short-term effects due to averaging of flow information. The aim of this study was to examine the impact of oxygen supply on respiration-related flow rate variations by non-electrocardiographic triggered real-time phase-contrast MRI (PC-MRI) in patients after total cavo-pulmonary connection (Fontan).

Methods

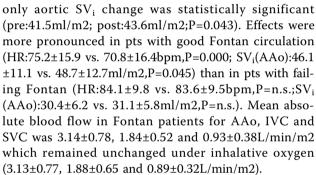
Real-time PC-MRI using EPI (TR/TE_{eff} /flip=12-14ms/ 3.3ms/40°, temporal resolution=24-28ms) was applied to study respiration-driven blood flow fluctuations in the ascending aorta (AAo), superior vena cava (SVC) and inferior vena cava (IVC) under normal breathing prior and after administration of 100% oxygen (4l/min; 10min) in 27 Fontan patients (mean age=17.2±7.5yrs; range: 6.9 to 37.9a). According to a 13 parameters risk score, patients were grouped as having good (N=19) or compromised hemodynamics. Respiration-dependent flow rates were virtually generated by dividing the respiration curve into four segments: expiration, endexpiration, inspiration and end-inspiration.

Results

Under oxygen administration heart rate decreased from 77.6±15.7 to 75.9±14.6bpm (P=0.027). Mean body-surface indexed stroke volumes (SV_i) increased slightly but

³Department of Surgery for Congenital Heart Defects, Center for Congenital Heart Defects, Bad Oeynhausen, Germany

Full list of author information is available at the end of the article



Aortic flow rate was elevated during expiration (4.8 $\pm 5.5\%$) and decreased during inspiration (-2.9 $\pm 8.7\%$) in relation to mean blood flow, highest flow was detected during inspiration in IVC (81.1±55.3%) and SVC (18.6 ±30.8%) and lowest flow during expiration (IVC:-85.7 ±56.9%,P<0.05) and end-inspiration (SVC:-21.0±19.2%, P<0.05), respectively. Differences were unchanged under oxygen supply in AAo (4.4±5.8%,-3.4±8.6%,n.s.) and SVC (25.3±32.7%,-18.8±33.4%,n.s.), whereas were slightly elevated in IVC (94.5±66.3%,-98.0±69.0%). Differences were only statistically significant for end-expiratory IVC blood flow (P=0.033).

Conclusions

Real-time PC-MRI allows quantification of respiratoryrelated flow rate fluctuations in Fontan patients. In this study inhalative oxygen resulted in an increase of aortic stroke volume and a decrease of heart rate only in case of good hemodynamics. As patients with compromised Fontan circulation did not show significant changes under oxygen supply this provocation may be promising for prognostic aspects and the follow up under anti pulmonary-hypertensive medication.



Koerperich et al. Journal of Cardiovascular Magnetic Resonance 2015, **17**(Suppl 1):Q82 http://www.jcmr-online.com/content/17/S1/Q82

Funding

Sponsored by the Fördergemeinschaft Deutsche Kinderherzzentren (project Nr.W-BDO-019/2013).

Authors' details

¹Institute for Radiology, Nuclear Medicine and Molecular Imaging, Heart and Diabetes Center. North-Rhine Westfalia, Bad Oeynhausen, Germany. ²Ruhr-University of Bochum, Bochum, Germany. ³Department of Surgery for Congenital Heart Defects, Center for Congenital Heart Defects, Bad Oeynhausen, Germany. ⁴University of Bonn, Bonn, Germany.

Published: 3 February 2015

doi:10.1186/1532-429X-17-S1-Q82

Cite this article as: Koerperich et al.: Impact of oxygen as a vasodilator on respiration-related Gontan hemodynamics assessed by real-time phase-velocity MRI. Journal of Cardiovascular Magnetic Resonance 2015 17 (Suppl 1):Q82.

Submit your next manuscript to BioMed Central and take full advantage of:

- Convenient online submission
- Thorough peer review
- No space constraints or color figure charges
- Immediate publication on acceptance
- Inclusion in PubMed, CAS, Scopus and Google Scholar
- Research which is freely available for redistribution

Submit your manuscript at www.biomedcentral.com/submit

