P-200

Optimizing ECG-triggering during cardiovascular magnetic resonance and its impact on blood flow quantification in patients with congenital heart disease

Knesewitsch T. (1), Meierhofer C.(1), Rieger H.(1), Seligmann M.(1), Schneider P.(1), Lyko C.(1), Steinlechner E.(1), Rößler J.(2), Frank M.(2), Nerad M.(1), Martinoff S.(1), Hess J.(1), Stern H.(1), Fratz S.(1)
German Heart Centre of the State of Bavaria and the Technical University Munich (1); Siemens AG, Imaging & Therapy Division, Magnetic Resonance,Erlangen, Germany (2)

Background:
Optimal ECG-triggering is of paramount importance for correct blood flow quantification during cardiovascular magnetic resonance (CMR). However, optimal ECG-triggering and therefore blood flow quantification is impaired in many patients with congential heart disease (CHD) due to complex QRS patterns. Therefore, a new ECG-trigger algorithm was developed to address triggering problems due to complex QRS-patterns.
The aim of this study was to test this new ECG-trigger algorithm in routine patients with CHD and its impact on blood flow quantification.

Methods:
35 consecutive routine patients with CHD undergoing CMR were included in the study. (40% Fallot´s Tetralogy, 20% aortic arch, 14% TGA, 26% others; age 26+/-11 yrs)
In all patients blood flow in the ascending aorta was quantified using the standard ECG-trigger algorithm and the new ECG-trigger algorithm in random order. Blood flow quantified using the standard or new ECG-trigger algorithm was compared by Bland-Altman analysis.
Four blinded investigators evaluated the vector clouds and trigger points of both ECG-trigger methods. Evaluation criteria were false positive and false negative triggered QRS-complexes (specificity and sensitivity), and accuracy of detection. Accuracy of detection was defined as time scatter of the trigger around the correct trigger point.

Results:
Blood flow quantification using the standard or new ECG-trigger algorithm differed more than 5% in 31% of the cases.
Specificity, sensitivity, and accuracy (p=0,028) of detection significantly increased using the new ECG-trigger algorithm compared to the standard ECG-trigger algorithm.

Conclusion:
Our results show that optimizing ECG-triggering during CMR has a large impact on blood flow quantification in approximately 1/3 of routine patients with CHD. We furthermore suggest that incorrect ECG-triggering is a major source of error in blood flow quantification of many patients with CHD undergoing CMR.