Functional parameters of the Fontan circulation reflected in diffusion-weighted imaging of the liver.

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Introduction- Patients with a Fontan circulation tend to develop liver fibrosis, cirrhosis and even hepatocellular carcinoma. Diffusion-weighted imaging (DWI) is an upcoming magnetic resonance technique for detecting and staging hepatic fibrosis and cirrhosis. We hypothesize that the liver reflects functional aspects of the Fontan circulation and that DWI provides a new non-invasive tool to evaluate the liver in time.

Methods- In a cross-sectional study, Fontan patients (n=59) were evaluated by liver DWI. The association between apparent diffusion coefficients (ADC) and patient characteristics, laboratory measurements and functional aspects of the Fontan circulation (NYHA class, maximum oxygen uptake during exercise and cardiac index) was assessed.

Results- Liver ADC values were low (0.82×10-3±0.11×10-3 mm²/s) compared with literature values for healthy volunteers and correlated significantly with calculated liver fibrosis/cirrhosis scores (Fib-4 score, p=0.019; AST/ALT ratio, p=0.009), antithrombin (p=0.006) and gamma-glutamyl transferase (p=0.031). Furthermore, ADC values correlated negatively with follow-up duration (p<0.001) and positively with functional aspects of the Fontan circulation (cardiac index, p=0.019). No correlation between ADC values and exercise testing was found. In multivariate analyses, duration of the Fontan circulation was the strongest predictor of ADC values.

Conclusions- Evidence of fibrosis, measured by decreased ADC values, was present in Fontan patients and associated with the duration of the Fontan operation and functional aspects of the Fontan circulation. The DWI provides a safe instrument for liver monitoring in Fontan patients.