Elevation of gamma-glutamynal transpeptidase reflects hepatic impairment caused by a variety of mild stresses in Fontan patients

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Background: Hepatic impairment is said to occur after Fontan because of elevated pressure in inferior vena cava (IVCp). However, we often encounter hepatic impairment without IVCp-elevation in Fontan patients. We sometimes find levels of gamma-glutamyl transpeptidase (GGT) rising after Fontan. We investigated whether we could identify the cause of hepatic impairment by elevation of GGT (GGT-elevation). Methods: The medical records of 116 patients after Fontan procedure were reviewed. Cardiac catheterizations and blood tests were performed in stabilized period after Fontan between 2004 and 2014. First, we compared GGT levels between before and after Fontan. Second, we defined GGT-elevation as GGT levels in the top fifth of 116 post-Fontan patients (GGT ≥ 119 U/L). Cardiac performances were determined which affected GGT-elevation. Results: Levels of GGT were higher after Fontan than those before Fontan (16 vs. 78 U/L, p < 0.0001). Both levels of aspartate and alanine aminotransferase were significantly increased after Fontan, the rises of which were slight respectively. After multivariate analysis GGT-elevation was independently associated with odds ratio of 9.0 (p=0.001) for IVCp (≥ 13mmHg), 5.3 (p=0.006) for index of pulmonary artery (< 170mm2/m2), 4.5 (p=0.010) for ejection fraction of major ventricle (≤ 50%), and 4.1 (p=0.016) for levels of atrial natriuretic peptide as index of elevated intravascular volume (≥ 54 pg/ml). In monovariate analysis GGT-elevation was significantly related to wedge pressure of pulmonary artery (≥ 7mmHg). Levels of brain natriuretic peptide had no association with GGT-elevation. The rate of patients with GGT-elevation increased with the number of risk factors growing from 0 to 5: 5% of patients had GGT-elevation at no risk factor; 14% at 1; 19% at 2; 54% at 3; 80% at 4; 100% at 5. Conclusion: Our study showed levels of GGT were highly elevated after Fontan procedure, by means of which we could infer the risk factors of liver impairment in Fontan patients. Narrow pulmonary artery, low ejection power, and venostasis, all of which were mild change, were independently related to hepatic impairment other than IVCp-elevation. We should attend GGT-elevation and these risk factors for hepatic involvement, even if Fontan patients did not have IVCp-elevation.