

**Oxygen saturation lowering develops on the background of cardiac depression in Fontan patients**

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Introduction: Fontan patients are likely to possess low oxygen saturation (SatO<sub>2</sub>), even if they do not own obvious right-to-left shunts, such as pulmonary arteriovenous fistula and fenestration from conduit to atrium. Such people sometimes complain of heart failure symptoms. We predicted degradation of cardio-pulmonary circulation would also provoke low SatO<sub>2</sub>.

Methods: The medical records of 382 Fontan patients were reviewed aged from 1 year to 41 years. They underwent cardiac catheterization between 2010 and 2018. We defined Low SatO<sub>2</sub> as SatO<sub>2</sub> 90% or under (n=65). Cardio-pulmonary indexes were determined which were connected with Low SatO<sub>2</sub> (n=86) by monovariate and multivariate analysis.

Results: Nine cardio-pulmonary factors were significantly different between Fontan patients with and without Low SatO<sub>2</sub>. Employing 283 patients who possessed no lost data for these 9 factors (Low SatO<sub>2</sub>: n=67), we investigated relevance indexes to Low SatO<sub>2</sub>. In mono-variate analysis, following factors were significantly related to low SatO<sub>2</sub>, such as end-diastolic ventricular volumes  $\geq$  205% (p=0.0030), end-systolic ventricular volumes  $\geq$  108% of Normal ventricular volumes on end-diastole (p=0.022), end-diastolic ventricular pressures  $\geq$  14 mmHg (p=0.020), end-systolic ventricular pressures  $\leq$  64 mmHg (p=0.035), pulmonary capillary-wedge pressures  $\geq$  13 mmHg (p<0.001), central venous pressures  $\geq$  17 mmHg (p=0.011), pulmonary artery indexes  $\leq$  123 mm<sup>2</sup>/m<sup>2</sup> (p<0.001), pulmonary arteriovenous fistula (p=0.024), and fenestration from conduit to atrium (p<0.0001). After multivariate analysis, Low SatO<sub>2</sub> was independently associated with following 5 factors: lowered ventricular pressures on end-systole (Odds ratio 7.8: p=0.035); elevated pressure of pulmonary capillary wedge (QR 5.5: p<0.001); narrow pulmonary arteries (OR 6.5: p=0.010); pulmonary arteriovenous fistula (OR 63.9: p<0.001); fenestration (OR 10.1: p<0.001). Explanatory coefficient was high (0.42) for low SatO<sub>2</sub> by these 10 factors.

Conclusion: Our study showed that Low SatO<sub>2</sub> was associated with cardio-pulmonary disorders other than apparent right-to-left shunts in Fontan patients. All aberrant values that we sought in this study were far outside, which indicated that Fontan circulation was going to collapse. If we detected Low SatO<sub>2</sub> newly at a hospital visit, we should perform a variety of examination to suspect serious disturbance of cardio-pulmonary circulations.