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**Visualization of the Intracavitary Blood Flow in Systemic Ventricles of Fontan Patients by Contrast Echocardiography Using Vector Particle Velocimetry.**

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Introduction: Diastolic vortex formation in Fontan patients may have an impact on cardiac function. Therefore, this study aimed at assessing and characterizing vortex flow patterns in patients with Fontan circulation in comparison with healthy controls.

Methods: Twenty-six patients (11 fontan and 15 normal patients) underwent echocardiography with intravenous contrast agent (Sonovue®) administration. Dedicated software was used to perform particle image velocimetry (PIV) and to visualize intracavitary flow in the systemic ventricles of the patients. Vortex parameters including vortex depth, length, width, and sphericity index were measured. Vortex pulsatility parameters including relative strength, vortex relative strength, and vortex pulsation correlation were also measured.

Results: Vortex length (VL) was significantly lower in Fontan patients ( $0.543 \pm 0.102$  vs  $0.651 \pm 0.125$ ,  $P=0.024$ ). Vortex width (VW) was higher ( $0.363 \pm 0.093$  vs  $0.276 \pm 0.044$ ,  $p=0.014$ ) and sphericity index (SI) was lower ( $1.566 \pm 0.439$  vs  $2.421 \pm 0.626$ ,  $p=0.001$ ) in the normal group. Relative strength (RS) ( $0.756 \pm 0.517$  vs  $1.903 \pm 0.471$ ,  $p<0.0001$ ) and vortex relative strength (VRS) ( $0.190 \pm 0.113$  vs  $0.433 \pm 0.141$ ,  $p<0.0001$ ), were significantly lower in the Fontan patients group.

Conclusions: Fontan patients had aberrant flow patterns as compared to normal hearts in terms of position, shape, sphericity and direction of the main vortices. Whether vortex characteristics are related with clinical outcome is subject to further investigation.