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Patients after Fontan with a “total cavopulmonary connection” Fontan modification develop more collateral flow compared to “old-fashioned” Fontan modifications.

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Objectives: Fontan palliation has evolved over time. Among many modifications creation of “total cavopulmonary connection (TCPC) ” Fontan such as intracardiac tunnel or extracardiac conduit has been proposed as a superior alternative to “old-fashioned” Fontan modifications such as RA-PA, or RA-RV tunneling. Collateral flow is a well-known residuum in patients with Fontan. However, no studies have examined collateral flow between different types of Fontan modifications. So the aim of this study was to compare collateral flow of patients with a TCPC to collateral flow of patients with “old-fashioned” Fontan modifications.

Methods: We conducted a retrospective study on patients with any type of Fontan, who underwent a routine clinical CMR at our institution over a 6-year period with collateral flow quantification. The entire cohort was divided into two groups: 32 patients with TCPC, (median age 15(2-60)yrs.); 7 patients with “old-fashioned” Fontan modifications, (median age 31(21- 35)yrs.). Patients with a fenestration were excluded. We determined collateral flow by using the commonly used equation:

flow volume aorta ascendens – (flow volume superior vena cava + flow volume inferior vena cava)

Results: Collateral flow was larger in patients with a TCPC compared to patients with “old-fashioned” Fontan modifications [median 0.6((-0.1)-1.7) vs. 0.2((-0.04)-0.5) L/min/m², p<0.006]. Additionally, cardiac index measured as the flow volume in the aorta ascendens was also larger in patients with a TCPC compared to patients with “old-fashioned” Fontan modifications [median 3.2(2.2-4.9) vs. (2.6(1.9-3.3) L/min/m², p<0.01].

Conclusions: Patients years after any type of Fontan modifications have substantial collateral flow. However, patients with a TCPC have significantly more collateral flow compared to patients with “old-fashioned” Fontan modifications. This leads to a significantly higher work load of the heart as demonstrated by the larger cardiac index of patients with a TCPC compared to patients with “old-fashioned” Fontan modifications. We suggest that the larger collateral flow in TCPC may be due to different flow characteristics in the superior vena cava compared to “old-fashioned” Fontan modifications.