

CPET in Congenital Heart Disease (Prof. Dr. Alfred Hager)

Cardiopulmonary Exercise Testing (CPET) holds paramount importance in the lifelong evaluation and management of patients with **Congenital Heart Disease (CHD)**, serving purposes in diagnosis, risk assessment, guidance, and counseling. Clinicians are advised to **never trust a patient pretending to have a good exercise capacity**.

Diagnostic Applications: CPET can detect acute circulatory failure (e.g., RV failure) and characterize cardiac shunts.

- **Left-to-Right Shunt (L to R):** This pattern is similar to deconditioning or early HF, featuring a reduced VO_2/WR , low PeakVO_2 , flat O_2 -pulse, and delayed recovery. It can predispose to exercise-induced PAH.
- **Right-to-Left Shunt (R to L):** This is characterized by a significant SpO_2 decrease, VO_2/O_2 -pulse} flattening, and excessive ventilatory drive (increased VE, RER). To differentiate a true shunt from VQ-mismatch, a **Hyperoxia Test** ($\text{FiO}_2 = 100\%$) is used; a true shunt yields an $\Delta \text{SpO}_2 < 10\%$.

An increased VE/VCO_2 -slope suggests L/R-heart failure, PAH, R to L shunt, or V/Q mismatch. For conditions like Fontan, **invasive CPET (iCPET)** is necessary to diagnose exercise-induced PH.

Prognosis and Guidance: CPET is a powerful predictor of survival. Adults with CHD (ACHD) with a $\text{Peak VO}_2 < 15.5 \text{ ml/kg/min}$ face a 5.6-fold increased mortality risk. Results guide therapeutic decisions such as ICD implantation, HT listing, PAH therapy escalation, and the timing of surgeries (e.g., tricuspid repair in Ebstein).