

Pressure volume relations obtained by 3D-real-time echocardiography and mini-pressure wire - multimodal validation-studies with MRI and conductance-catheter in piglets

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Introduction: Pressure-volume relations (PVR) provide vital information regarding cardiac pathophysiology and function. In children, acquiring PVR by conductance technology (Cond) is – due to catheter size - restricted to older age. The aim of the study was to compare the results of PVR - calculated from 3D-echo (3DE) volume data and simultaneously obtained pressure data with conductance technology. **Methods:** In 16 piglets (weight: 3.6-8.0, mean 5.9±1.3kg), dp/dt max, dp/dt min, systolic myocardial elastance Ees, arterial elastance Ea, diastolic relaxation constant Tau and end-diastolic PVR were determined under various conditions: baseline, epinephrine and esmolol infusion, using 3DE with simultaneous recording of ventricular pressure by a mini pressure wire (Radi, St. Judes) and compared to Cond. To validate the accuracy of 3D volume data, MRI was performed in 8 piglets. **Results:** Computation of PVR was comparable to results obtained by Cond (Fig). Agreement between MRI and 3DE was good (Table). Inter- and intraobserver- coefficients of variation were below 5% for all parameters. **Conclusions:** Calculation of PVR from 3DE volume curves is a feasible and reliable method to assess different conditions of cardiac function in small hearts. Due to its minimal invasive character this methodology may be implemented into daily practice and contribute to clinical decision making.

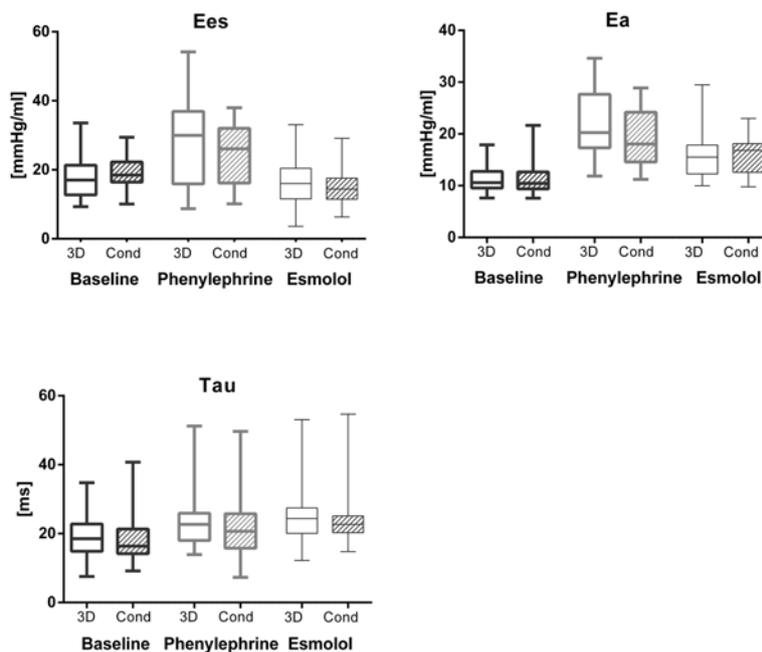


Figure: 3D-Echo (3D)-derived pressure-volume relations compared to parameters obtained by conductance technology (Cond) under various conditions (mean and 95% CI), n=16.

Bland Altman Analysis MRI vs 3D					
Parameter	Bias	95% Limits of Agreement	Parameter	Bias	95% Limits of Agreement
EDV [ml]	-0.03	-1.2; 1.1	SV [ml]	-0.01	-2.4; 2.2
ESV [ml]	-0.12	-1.1; 0.9	EF%	2.71	-5.6; 11