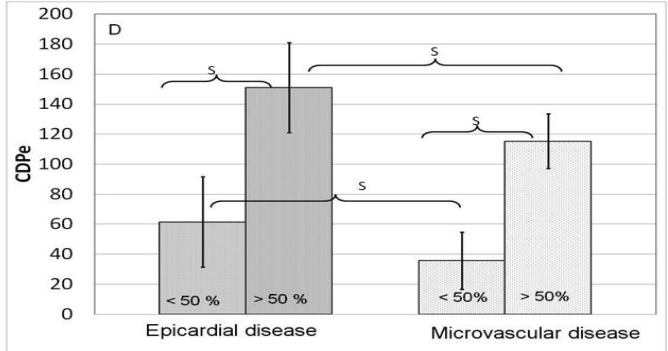
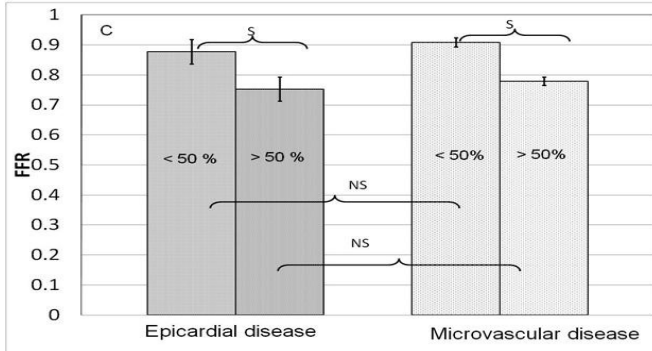
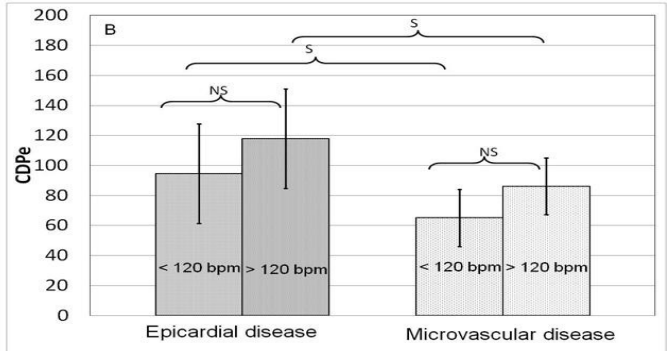
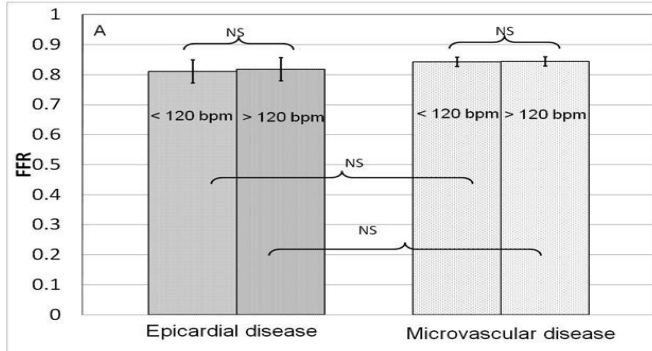


Influence of Heart Rate on Pressure Drop Coefficient and Fractional Flow Reserve for Epicardial Coronary Stenosis and Microvascular Dysfunction

Kranthi K Kolli, Srikara V Peelukhana, Massoud Leesar, Mohamed Effat, Tarek Helmy, Arif Imran(University of Cincinnati), Eric W Schneeberger(Deaconess Hospital, Cincinnati, OH), Paul Succop (University of Cincinnati), William Gottliebson, Cincinnati Children's Hosp Medical Center), Rupak K Banerjee (University of Cincinnati)

Introduction: Fluctuations in heart rate (HR) and blood pressure often occur during coronary catheterization procedures. For improved functional diagnostics, evaluation of coronary circulation should rely on methods independent of these hemodynamic changes. This study evaluates the influence of HR on both Fractional Flow Reserve (FFR) and Pressure Drop Coefficient (CDPe) for distinguishing epicardial coronary stenosis (ECS) with variable percentage area stenosis (AS) from microvascular disease (EMVD). **Hypothesis:** We hypothesize that the CDPe, assessed *in vivo*, can delineate between ECS and EMVD under variable HR conditions. **Methods:** Simultaneous measurements of distal hyperemic coronary-arterial pressure drop (Δp) and distal average peak flow velocity (APV) were performed on 7 pigs (42 ± 3 kg) with only ECS and 14 pigs (52 ± 5 kg) with concomitant ECS and EMVD, using a dual sensor-tipped guide wire. ECS and EMVD were created using angioplasty balloons and $90 \mu\text{m}$ polystyrene microspheres, respectively. CDPe was calculated as $(\Delta p) / (0.5 * 1.05 * APV^2)$. To investigate the effect of HR, FFR and CDPe were assessed for: “AS<50%” and “AS>50%”, for HR<120 and HR>120 bpm. A 2-way repeated measure ANOVA was performed with 406 and 500 measurements for ECS and EMVD respectively. **Results:** The mean values of FFR (Fig. A) for ECS and EMVD under HR <120 (0.81 ± 0.04 , 0.84 ± 0.015) and > 120 bpm (0.82 ± 0.04 , 0.85 ± 0.015) are not significantly different ($p > 0.05$). In contrast, the mean values of CDPe (Fig. B) for ECS and EMVD under HR<120 (94.7 ± 33.2 , 65.1 ± 18.9) and > 120 bpm (117.8 ± 33.2 , 86.2 ± 18.9) are significantly different ($p < 0.05$). FFR values (Fig. C) with “<50%AS” and “>50%AS” for ECS (0.88 ± 0.04 and 0.75 ± 0.04) and for EMVD (0.91 ± 0.02 and 0.78 ± 0.02) as well as CDPe (Fig. D) with “<50%AS” and “>50%AS” for ECS (61.6 ± 3 and 150.9 ± 3) and for EMVD (35.8 ± 19.1 and 115.5 ± 18.2) are significantly different ($p < 0.05$). **Conclusion:** CDPe can delineate between ECS and EMVD under variable HR conditions.



S --- p<0.05 NS --- p>0.05