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Abstract 15619: Stress Myocardial Elastography for Improved Ischemia and Infarction Detection

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Abstract

Introduction: Coronary artery disease is typically diagnosed via nuclear imaging or angiography, which are expensive and/or invasive, impeding early diagnosis. Myocardial Elastography (ME) is a quantitative echocardiographic strain imaging method shown capable of detecting ischemia. In this study, stress testing is hypothesized to increase reliability in differentiating normal from ischemic or infarcted myocardial regions.

Methods: In an initial study, the left anterior descending artery of a 23kg mongrel was partially ligated to cause 60% decrease in coronary flow. Transthoracic short-axis echocardiography views were acquired at mid and apex levels, at rest and during pharmacological stress (8μg/kg/min dobutamine).

Stress ME was also performed in seven patients undergoing PET/SPECT dipyridamole stress tests. Short axis views at mid, base, and apex were acquired, totaling 21 scans, five of which were excluded due to poor image quality. Every image was divided per the 17-segment heart model yielding 86 segments (N=86). Each segment's rest-to-stress strain change (Δε) was calculated as the difference between its median strain at rest versus stress. One-way ANOVA analysis was performed on Δε of normal, ischemic, and infarcted segments as diagnosed by nuclear imaging (Fig 1).

Results/Discussion: At rest, the occluded canine myocardium did exhibit lower mid-level strain (3.65%) than normal (7.58%), but stress ME showed negative Δε in LAD-perfused regions, emphasizing the pathology.In patients, mean Δε in normal segments (9.09±2.07%) was higher than

in ischemic (-19.6 ± 12.3%) and infarcted regions (-8.99 ± 8.99%). Statistical significance ($p<0.05$) was found between normal and ischemic regions for Δε but not for strain at rest alone, indicating improved pathology detection due to stress testing. The Δε in infarcts followed a similar but nonsignificant trend. Ongoing studies investigate a larger patient cohort to better characterize infarct and stage ischemia.

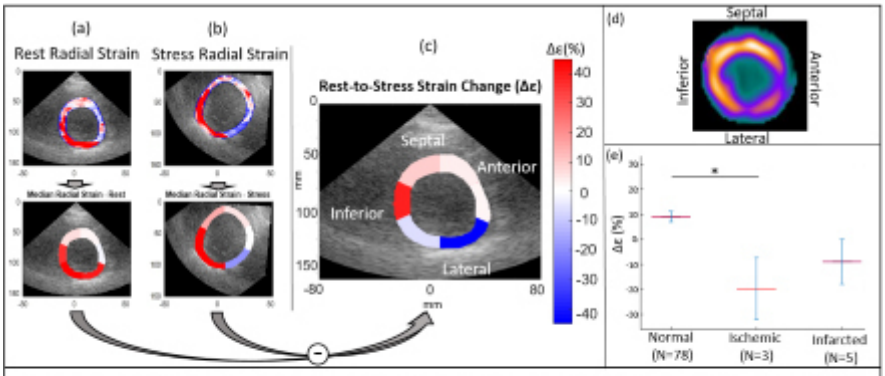

Figure 1: Stress ME performed on a patient with anterolateral ischemia and anterior/inferiorlateral infarction. Shown are the (a) estimated and median strain at rest, (b) estimated and median strain during stress, (c) difference between stress and rest (Δε) for each segment, (d) PET perfusion map for this patient, (e) Mean and SEM of Δε for all imaged patients (*$p<0.05$)

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Footnotes

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