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What is the effect of Iodine Contrast Agents on the Subharmonic Signal Generated from Ultrasound Contrast Agents?

Neal Kalantri, Cara Esposito, Dr. Jaydev Dave*

Subharmonic-aided pressure estimation (SHAPE) is a technique utilizing subharmonic signals from microbubble-based ultrasound contrast agents (UCA's) to noninvasively record pressures. Cardiac applications of SHAPE have been demonstrated in canines where low errors (0.19-2.5mmHg) were observed in canine ventricle pressures between the SHAPE technique and pressure catheter measurements. Validation of SHAPE involves simultaneous measurements by a pressure catheter (iodine contrast is used to guide catheter placement) and by SHAPE using UCAs. The goal of this experiment is to determine if mixing Visipaque (iodine contrast, GE Healthcare, Oslo, Norway) and UCAs effects the subharmonic signal.

The study was performed in an *in vitro* closed-loop flow-phantom setup. Definity (Lantheus Medical Imaging, N Billerica, MA) and Sonazoid (GE Healthcare, Oslo, Norway) were the UCAs used. Experiments were conducted using Visipaque only, Visipaque followed by UCA, UCA followed by Visipaque, and UCA only. Subharmonic signals were abstracted from raw radiofrequency data and were compared to see if Visipaque administration had an effect on the subharmonic signal. Unfortunately, current results are inconclusive due to a few issues. During data collection, the ultrasound machine had technical errors and needed to be recalibrated, requiring data collection to be restarted. Additionally, after data collection was completed, the concentration of ultrasound contrast agent being used was not providing an expected enhancement to the subharmonic signal. Different concentrations are now being tested. Once the issues are resolved, linear regression analysis will be used to evaluate the matching of SHAPE and pressure catheter data and the effect of adding Visipaque and UCAs.