

## Tactile Feedback Provides Real Time In Vivo Tissue: Catheter Contact Force Information During Cardiac Radiofrequency Ablation

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### Introduction / Objectives:

SMART AF showed consistent contact during RFA improves pulmonary vein isolation but contact force displays (CF) led to 2.5% risk of tamponade and required lengthy procedural and fluoroscopy times. When HRS definition is employed efficacy was 66%. TOCCASTAR demonstrated non-inferiority and 1.9 vs. 1.4% complications with and without CF, respectively ( $p = NS$ ). CF require recruitment of saturated visual attentional resources. The benefits of tactile over visual feedback are established but catheters do not enable palpation of biophysical events. Prior work using a novel haptic system (HS) demonstrated that subjects palpated recorded CF, pressure, and blood flow signals and reacted to palpation of tissue contact significantly faster than to simple on off visual cues. We tested the HS's ability to input CF data and generate tactile feedback during RFA in live swine. We hypothesized that HS would generate representative real-time tactile feedback in a handle during RFA.

### Methods:

A single operator performed RFA of 30 sites within both atria and ventricles in two adult anesthetized swine using NavX Ensite system. The Tacticath system was interfaced with HS. Three physicians and 2 non-physicians not performing the procedure were blinded to CF and reported if they palpated contact and variable amplitude CF with catheter manipulation ( $n=15$ ) and RFA ( $n=15$ ) while holding a Haptic Handle. The unblinded operator was asked to correlate tactile sensations with visual CF data. Necropsy specimens analyzed the presence of tissue necrosis at RFA sites.

### Results:

CF and variations in CF amplitude were palpated by physician and non-physician subjects at all anatomic locations with and without RFA. There was pathologic evidence of effective delivery of RFA and tissue necrosis at times when CF was palpable with mean CF = 35.6 gm (range 20-40). The operator palpated variations in CF that correlated with CF values during catheter manipulation with the handle attached to ablation system.

### Conclusions:

HS provides real time, clinically relevant CF information in a tactile format that is readily interpretable by blinded physicians and non-physicians during catheter manipulation and RFA. HS can eliminate delays in reaction time required to look at a CF display. The HS holds promise to improve procedural success, reduce complications and fluoroscopic / operative times.