



Incidental Findings Discovered at Computed Tomography Scan for Noninvasive 3D Cardiac Mapping Using the CardioInsight™ System

Toral Patel, MD; E Rrapo Kaso, MD; A Lam, MD; KD Hagspiel, MD; KC. Bilchick, MD; A Darby, MD; N Mehta, MD; PK. Mason, MD; R Malhotra, MD; JD Ferguson, MD; J.M Mangrum, MD, P Norton, MD.
University of Virginia Health System, Charlottesville, Virginia, U.S.A

Background

- Noninvasive 3D cardiac mapping, CardioInsight™ Cardiac Mapping System, (Medtronic, Inc. Minneapolis, MN) provides useful information prior to catheter ablation of cardiac arrhythmias.
- Analysis requires the patient to wear a multi-electrode mapping vest and then undergo a CT from the neck through the abdomen in order to spatially locate each vest electrode and relate it to the cardiac surface.
- **Objective:** To investigate the prevalence and analyze the location and clinical significance of incidental findings detected at CT for noninvasive cardiac 3D mapping system as compared with CT for typical catheter guidance.

Methods

- A total of 168 patients (19-89 years, 94% male) underwent noninvasive cardiac 3D mapping integrated with CT imaging prior to AF ablation (130), PVC/VT ablation (17) or CRT implant (21) from February 2017 to June 2019.
- Exam reports were reviewed for presence and clinical significance of incidental findings. Images were reviewed for location of findings. Incidental findings were categorized by organ system (thyroid, pulmonary, liver, kidney, adrenal, spleen, GI, vascular, bone), clinical significance, and by location outside a typical CT scan range.
- **Incidental finding:** previously undiagnosed medical condition discovered unintentionally with CT scan when utilizing the CardioInsight™ Mapping system for non-invasive mapping.
- **Extra finding with vest:** finding noted outside of CT chest imaging parameters but within vest imaging parameters
- **Clinically significant finding:** finding that requires follow-up or further clinical imaging

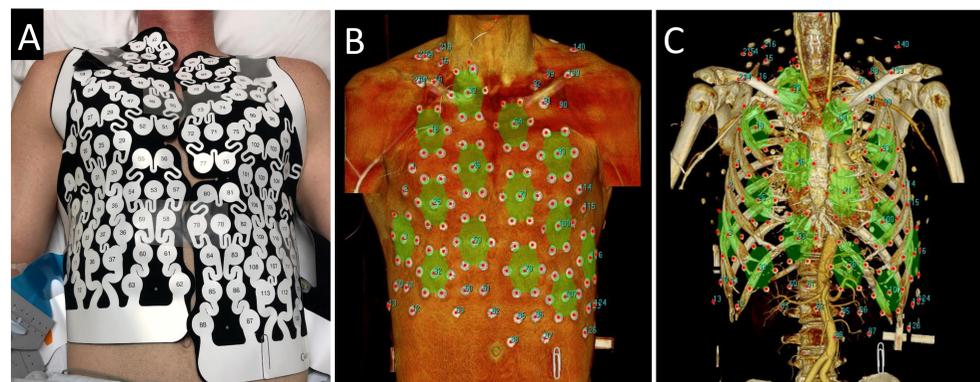


Figure 1. A) The CardioInsight™ vest with 252 body surface electrodes. B) and C) Identification of all surface electrodes and relationships to heart.

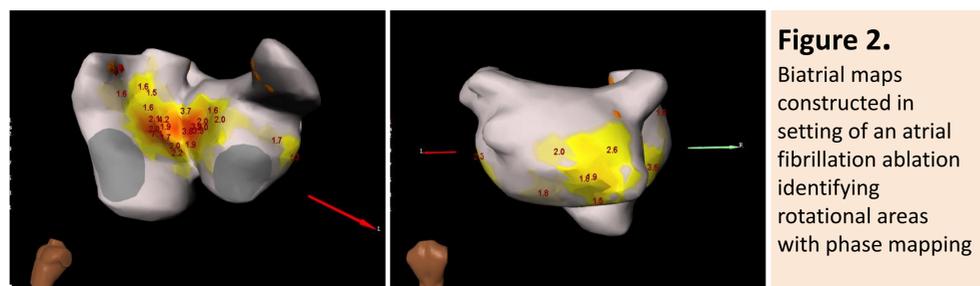
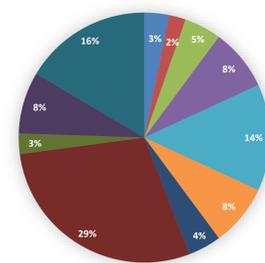


Figure 2. Biatrial maps constructed in setting of an atrial fibrillation ablation identifying rotational areas with phase mapping

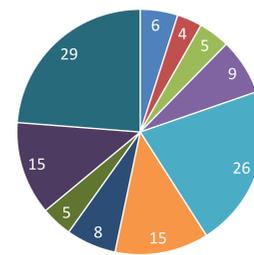
Results

Total incidental Findings

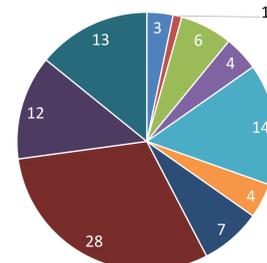


- Adrenal
- Cardiac
- Kidney
- Lymphadenopathy
- Spleen
- Vascular
- Bone
- GI
- Liver
- Pulmonary
- Thyroid

Number of Extra Findings with Vest



Number of Clinically Significant Findings



- **80%** (111/168) of patients had incidental findings.
- A total of 188 incidental findings were present
- 122 of the incidental findings were located outside of the typical scan range, with 92 being clinically significant.
- The most common organs outside the typical scan range with significant clinical findings (order of frequency) were kidney, thyroid and liver

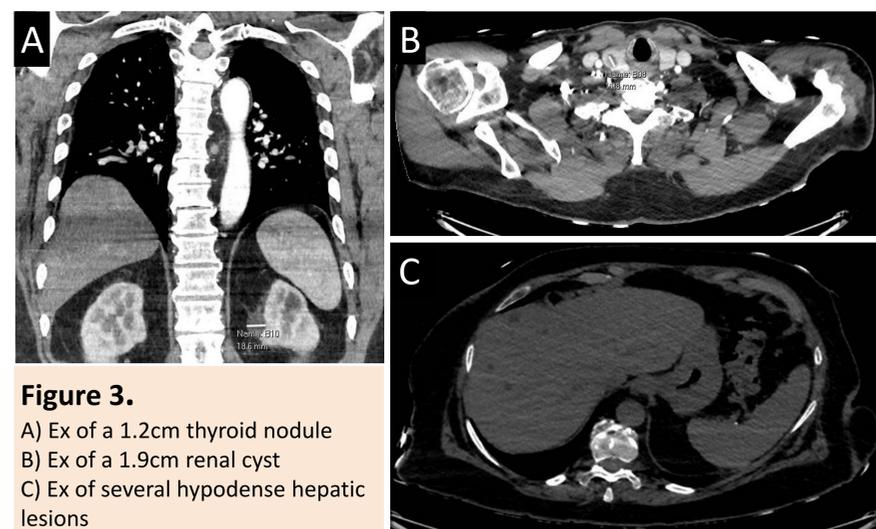


Figure 3.
A) Ex of a 1.2cm thyroid nodule
B) Ex of a 1.9cm renal cyst
C) Ex of several hypodense hepatic lesions

Conclusions

- A greater number of incidental findings were detected using a CT for 3D mapping as compared to CT for typical catheter guidance.
- 73% (122/188) of the clinically significant findings were located outside of the typical scan range.
- Larger CT field of imaging for 3D mapping may have important clinical implications beyond catheter ablation.