

MRI Simulation for Breast Cancer Radiotherapy Planning in Poorly Defined Tumor Cavities

Jonathan Massachi MS, Catherine Lu Dugan BA, Xin Miao PhD, Rita Freimanis MD, Christina Calvin MRSO, Kamal Singhrao PhD, Catherine Park MD, Nicolas Prionas MD, PhD, Jessica Scholey* PhD, Lisa Singer* MD, PhD

BACKGROUND

- Radiation therapy is a mainstay of breast cancer treatment
- Delineation of the tumor cavity is critical for boost or accelerated partial breast radiotherapy
- CT provides limited soft tissue contrast—especially challenging in the setting of oncoplastic closure or dense breast tissue without surgical clips

METHODS

- Patients with difficult-to-visualize cavities underwent CT and MRI simulation (n = 8) on a MAGNETOM Vida 3T MRI Simulator [Siemens Healthcare]
- T2 TSE Fat-saturated (FS) Free-breathing (FB), T2 HASTE , and T2 BLADE sequences were used
- Blinded, retrospective quantitative and qualitative analysis

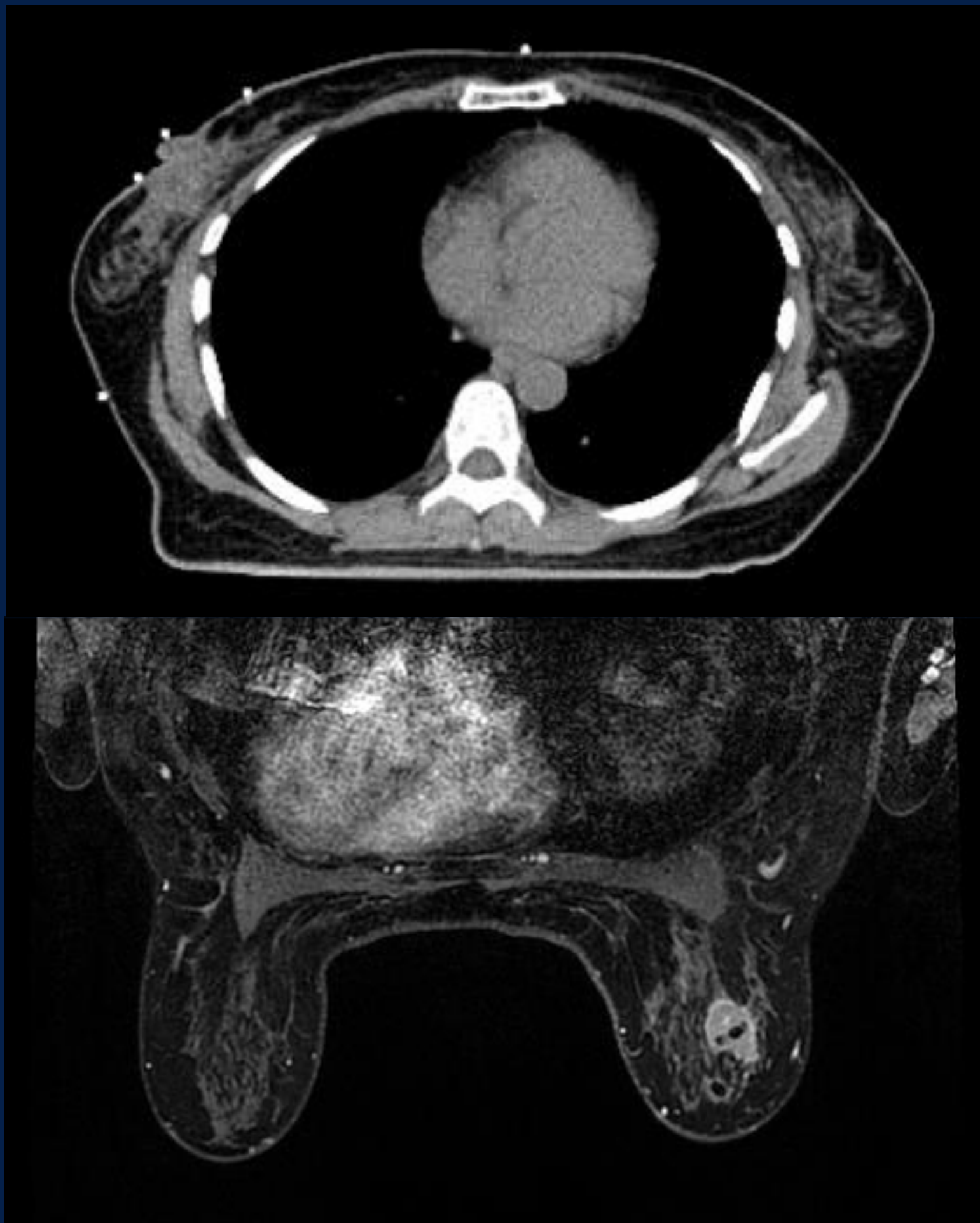
MRI enhanced tumor cavity visualization and treatment planning in the majority of cases



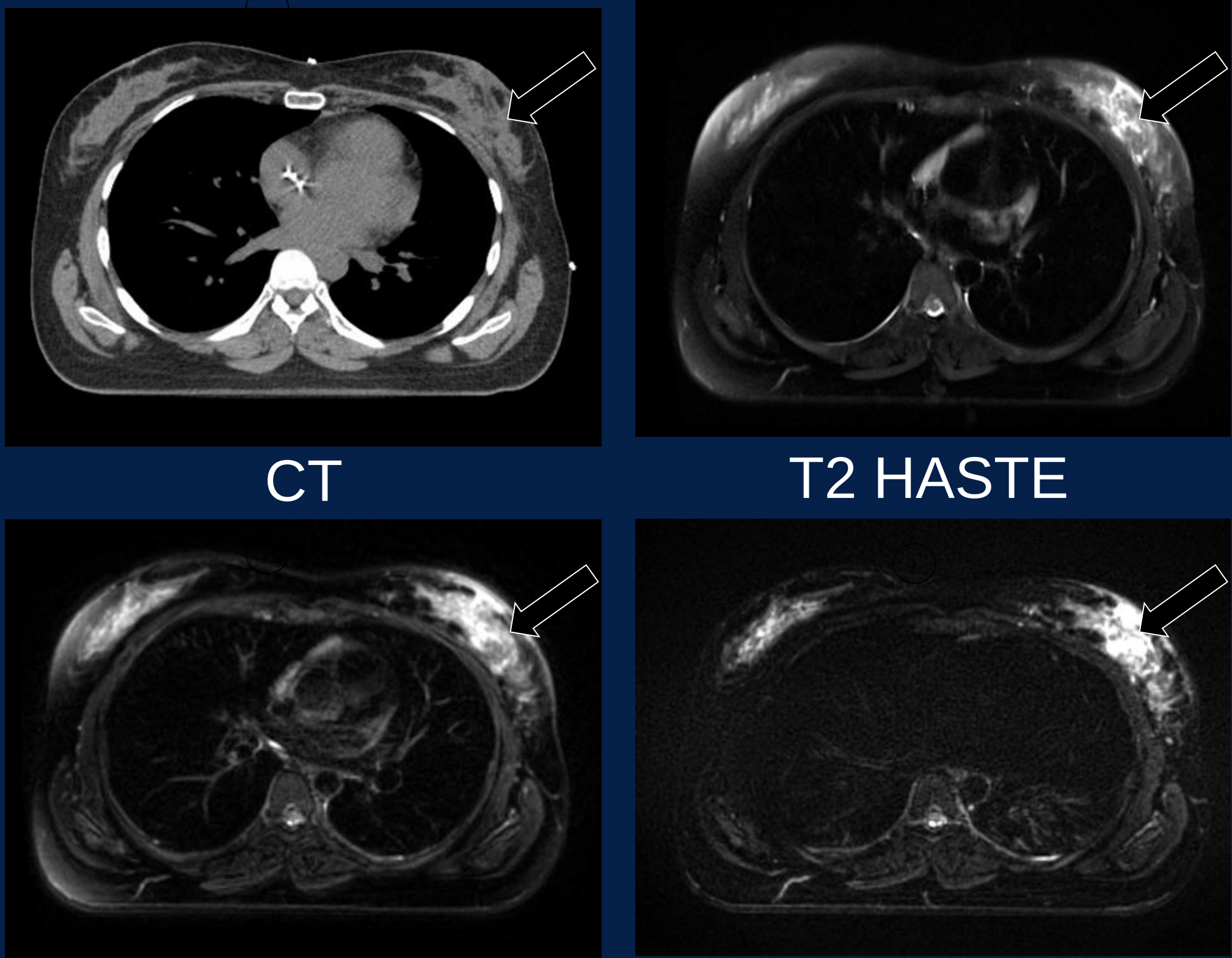
Supine and Prone MRI Simulation Setup

Patient	Cavity Volume CT-only (cc)	Cavity Volume CT+MR (cc)	Absolute Difference (cc)	Percent Difference (%)
1	33.47	15.36	-18.11	-54.1
2	46.58	34.6	-11.98	-25.7
3	8.39	5.56	-2.83	-33.7
4	3.15	3.62	0.47	14.9
5	1.15	7	5.85	508.7

Tumor Cavity Contour Volumes



CT vs pre-operative MRI (above) and post-operative MRI (below)



CT

T2 HASTE

T2 BLADE

T2 TSE FS FB



University of California San Francisco

Patient Characteristic	Value (%)
Age (Median [Range])	47.5 [35-66]
Breast Density	
• Heterogeneously Dense	7 (88%)
• Extremely Dense	1 (13%)
Oncoplastic Closure with Rearrangement	
• Yes	5 (62%)
• No	3 (38%)
Re-Excision	
• Yes	2 (25%)
• No	6 (75%)
Chemotherapy	
• None	2 (25%)
• Neoadjuvant	3 (38%)
• Adjuvant	3 (38%)

DISCUSSION

- **Breast MRI simulation impacted tumor cavity delineation in most cases**
- **T2 TSE FS Free-breathing sequence was preferred by raters**
- **Future work will further optimize imaging protocols and prospectively investigate clinical outcomes of this addition to treatment planning**

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