Hybrid Breast/Cardiac MR Imaging in Breast Cancer Patients: A Feasibility Study

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Introduction

- Breast cancer is prevalent and utilization of breast MR during cancer treatment is increasing.
- Monitoring for cardiac toxicity from chemotherapy in this patient population can lead to early diagnosis and treatment and therefore prevent treatment interruption.
- Cardiac magnetic resonance (CMR) provides high-resolution cardiac images without radiation.

Hypothesis

- We hypothesize that cardiac images can be obtained at the time of a breast MR study.
- Cardiac images will have adequate signal and can be useful in assessing left ventricular ejection fraction (LVEF) during chemotherapy.

Methods

- We included 15 patients enrolled in the I-SPY2 study to undergo sequential cardiac and breast MR imaging in one setting.
- Hybrid MR scans were performed at weeks 0, 3, 12 and 20 weeks as per I-SPY2 study protocol using a 3-T scanner (Figure 1).
- Short axis cine steady-state free precession images were obtained using breast coils at the basal, mid and apical levels of the left ventricle with the patient in a prone position (Figure 2).
- LVEF contouring was performed using WebPAX software.
- Agreement between LVEF from hybrid MR and echo (obtained within 4 weeks from the MR scan) was assessed using Bland-Altman analysis.

Results

- 12 patients were successfully recruited and 11 patients were included in the analysis (Table 1).
- 10 patients completed > 3 scans. The mean duration of the cardiac imaging was 10 ± 2 minutes.
- Bland Altman analysis revealed an average LVEF of 61±3% by echocardiography and 62 ± 6% by hybrid MR and the limits of agreement widened as the LVEF increased (Figure 3).

Conclusion

- Hybrid breast/cardiac MR scans in breast cancer patients can be performed and LVEF is analyzable.
- Larger studies to determine treatment effects during cancer treatment is feasible using hybrid breast/cardiac MR imaging.

Implications

- Performing sequential cardiac/breast MR during the process of cancer treatment would not only reduce the burden of tests performed on patients, but could also lead to a new understanding of the cardiac effects of newer chemotherapy agents in breast cancer treatment.

References

For HER2+ patients in the study, neoadjuvant chemotherapy agents in breast cancer treatment. Cardiac magnetic resonance imaging (CMR) was obtained to detect abnormalities and predict your therapeutic response with imaging and molecular analysis 2. MR imaging and molecular analysis 2; MRI, magnetic resonance imaging.

Table 1

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<thead>
<tr>
<th>LVEF (cm²)</th>
<th>Echo</th>
<th>Hybrid MR</th>
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<td>0.61±0.03</td>
<td>0.62±0.06</td>
<td>0.61±0.05</td>
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Figure 1: I-SPY2 Trial Design

Figure 2: Hybrid MR Scan

Figure 3: Bland Altman Analysis

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Disclosure

None