

AbstractID: 9503 Title: Breast tumor volume change estimation in whole breast automated ultrasound by image based registration and initial segmentation

**Purpose:** To estimate the change in breast tumor volume during treatment using 3D whole breast ultrasound (US) with segmentation of only the initial study. Image volume based registration (IVBaR) of the initial study to a subsequent study provides a transform which, when applied to the segmented tumor volume, gives the estimated subsequent volume.

**Method and Materials:** Nine patients undergoing neoadjuvant chemotherapy participated in 3D US scans using a GE Logiq 9. For each subject, the whole breast was scanned before, at mid-treatment and after a chemotherapy regimen of 115 +/-14 days. After acquisition, a senior breast imaging radiologist outlined a 3D tumor region in each image volume. Resultant volume changes ( $\Delta V$ ) were calculated. For the automated analysis, the original pre-treatment image volume was warped to the post-treatment image volume. The resultant transformation was applied to the segmented pre-treatment volume to determine an "automated" post-treatment volume and  $\Delta V$  for comparison with manual segmentation. In the follow-up reader study, comparisons were made of tumor volumes marked by 4 readers on unregistered and registered image volume pairs.

**Results:** Preliminary results of the analyzable seven cases showed a mean  $\Delta V$  of  $50\% \pm 24\%$  versus  $-43\% \pm 24\%$ , measured by the expert radiologist and semi-automated method, respectively. The mean fractional difference between  $\% \Delta V$  measures was  $-0.14 \pm 0.08$ .

**Conclusion:** Results to date suggest that tumor volume tracking is possible using a semi-automated US registration method, given the reasonable (14%) correspondence with volume change by expert segmentation. Since tumor volume estimation is difficult and time consuming, successful IVBaR could aid in detection and estimation of tumor changes in response to neoadjuvant chemotherapy. Potential future usage also exists in breast cancer screening and diagnosis.