

## AbstractID: 3912 Title: Use of internal body-area as a metric for retrospective 4D CT gating

**Purpose:** Current 4D CT acquisition techniques require the use of an external breathing metric, which adds time, cost and complexity to the procedure. If the use of the metric is not required after the imaging session, an internal metric may be adequate. The purpose of this study was to evaluate the use of the cross-sectional body area as an imaging-based internal metric for breathing motion using CT images acquired during free breathing.

**Method and Materials:** A 16-slice CT scanner (Philips Brilliance) was operated in ciné mode to acquire 25 scans consecutively at each couch position while patients underwent simultaneous quantitative spirometry. The cross-sectional body area was computed by automated image segmentation. The body areas for the 16 slices within each 2.4 cm-thick couch position were summed and compared to the corresponding tidal volume. The correlation between tidal volume and body area were examined to evaluate the quality of body area as a metric.

**Results:** Three patients were analyzed. The body area consistently show a high correlation with the tidal volume in the abdomen (correlation coefficients  $> 0.8$ , and residual error  $< 10\%$  of the total tidal volume). In the upper lung region, the correlation coefficients varied in a range of 0.2 to 0.99, and the residual errors were 5% to 30%. For each patient there was a transition region near the mid sternum where the correlation degraded dramatically.

**Conclusions:** For imaging of the upper abdomen, the body area appears to be a good breathing metric for generating 4D imaging studies. One method for improving this process may be to overlap successive couch positions by one slice location, thereby providing a CT slice with overlapping body-area measurements.