AbstractID: 5682 Title: Characterization of a Novel Anthropomorphic Plastinated Lung Phantom

Purpose: To quantify the anatomical and imaging characteristics of a novel anthropomorphic lung phantom constructed using plastination.

Method and Materials: The pig's thorax was scanned in-vivo at known partial pressures on a clinical CT (Siemens Sensation 16, 120kVP, 100mAs, recon 0.54x0.54x0.75mm^3). The lungs were extracted, inflated, and fixed by intra-tracheal perfusion of 10% formalin while the pulmonary vessels were injected with Silastic E RTV silicone. The specimen was dehydrated (remove and replace tissue fluid with an organic solvent) in cold acetone and the lungs were impregnated with a curable silicone polymer via slow decreasing pressure. Finally, the polymer was polymerized using a curing agent. The plastinated phantom was then scanned (120kVp, 200mAs, 0.43x0.43x0.75mm^3). Anatomical features, volume measurements, and CT values were compared using in-vivo and phantom clinical CT reconstructions.

Results: The plastinated phantom is stable on the timescale of years and retains major anatomical features of the in-vivo lung. The phantom airway volume was 66% of the in-vivo measurement at inspiration but equal to the measurement at expiration. Vessel and lung volume comparisons were complicated by incompletely filled vessels and air pockets inside the phantom; nevertheless, lung volume measurements differed by less than 15%. Mean CT values of the cardiac tissue in the phantom (168 +/- 46) were 132 HU higher than in-vivo (36 +/- 87). Mean CT values of the pulmonary tissue were nearly equivalent for both datasets, attributed to an 11% decrease in the apparent tissue density due to over-inflation during plastination.

Conclusion: This work shows that the novel plastinated lung phantom retains the anatomical and imaging characteristics of an in-vivo lung. This accurate and complex lung phantom has many uses including imaging system comparisons, providing a known, stable reproducible complex background for visibility studies and will be used for our own studies in lung tomosynthesis optimization.