AbstractID: 2863 Title: Respiratory Correlated CT: Acceptance and Clinical Introduction

Purpose:
Respiratory correlated CT (RC-CT) has the potential to enable individual margins and prevent geometrical miss in radiotherapy for lung cancer patients. The objective of this study was to develop a procedure for acceptance and clinical introduction of RC-CT.

Method and Materials:
RC-CT was performed with a modified Siemens Sensation 10 and Biograph PET/CT with extremely low pitch (0.1) in combination with a respiratory signal obtained by a pressure sensor in a chest belt. Two phantoms were used for acceptance: Phantom 1: A ventilator (12 and 20bpm) and balloon, on which metal markers and the chest belt were positioned. This phantom was used to test the accuracy of the system. Phantom 2: A sphere moving 34mm(A-P), 6mm(L-R) and 34mm(Cr-Ca) at 18bpm was used to evaluate distortion. Clinical introduction: In 16 NSCLC RT patients an RC-CT was performed and tumor movement was measured. The volume within which the visible tumor moved(IGTV), was delineated and projected onto the regular CT/PET used for treatment planning.

Results:
Phantom 1: Correlation between reconstructed and true displacement of the markers with respiration was excellent (R=.992 p<.001 for the vector movement). The relation between true and reconstructed displacement was not significantly different from identity. Phantom 2: The distortion was minimal, in each of the ten respiration phases the sphere volume (65cm^3) was accurately reconstructed within 4cm^3. Patients: In all patients, RC-CT could be successfully performed without coaching. The duration of the scan was always less than 90 seconds, with the whole procedure completed within 10 minutes. An RC-CT delivered an estimated dose of 20cGy (CTDI). Mean and range of movement was 2.5±1.6,0-6mm(A-P), 1.4±1.7,0-5mm(L-R) and 4.4±4.5,0-15mm(Cr-Ca).

Conclusion:
A procedure for acceptance and clinical introduction of RC-CT has been developed. The results of the tested RC-CT system were satisfactory and the system is now in clinical use.