

AbstractID: 11314 Title: ITV Delineation and Setup Verification for Image Guided Liver SBRT

Purpose: Many liver lesions are not easily seen on planning CT images. Implanted markers used to verify patient setup and/or gating create artifact that makes it even more difficult to delineate the boundary of these lesions. Target delineation is further complicated by the significant motion due to respiration. We have developed simulation and planning procedures that allow us to overcome these problems and approximate an ITV based on a single GTV contour and internal marker motion in a 4D CT scan.

Method and Materials: Patients are placed in a custom immobilization device and receive a free-breathing helical CT-simulation with IV contrast to provide the best visualization of the lesion. The GTV is defined on this first scan. Subsequently one or more gold markers are placed in the liver, in the lesion or as near as possible. A second CT-simulation is performed, without IV contrast but using 4D acquisition. The free-breathing scan is fused to one phase of the 4D scan and the GTV contour is then transferred to that scan. A technique has been developed to translate this contour to each phase of respiration based on the motion of the implanted marker. The envelope of these contours defines the ITV.

Results: This technique was first developed for SBRT treatments using the BrainLAB Novalis and iPlan Image software. It provided a satisfactory procedure for an otherwise unsolved clinical problem. More recently the same technique has been adapted to the Pinnacle treatment planning system for patients receiving SBRT on a Varian Trilogy. It provides the best CT visualization of liver tumors as well as providing implanted markers for patient setup. It accounts for respiratory tumor motion, although not deformations.

Conclusion: This systematic approach provides a means to delineate liver tumors, account for respiratory motion, and include implanted markers for accurate patient setup.