ABSTRACT

Radioactive seeds are used in permanent implants to treat tumor beds of locally resected lesions. Dosimetric analysis of the implant requires accurate information regarding the position of each seed. Biplane radiographic seed localization is more prone to error if the number of seeds is large and/or the images contain seeds that have changed position as a function of time because of either patient or organ motion. We have addressed these issues using a clinical treatment planning system and spiral CT images of 3- to 5-mm slice thickness for a left lung, 60-seed, I-125 implant near the heart. The seeds on each transverse CT image are delineated as a contour. Each polygon vertex of the contour represents a seed position. The total number of the vertices is greater than the number of the implanted seeds because a seed may appear on two consequent slices. The double counted seeds are easily identified by superposition of the contour from the previous slice onto the current slice. A double counted seed is localized by averaging the coordinates of its two vertices. Compared with biplane radiographic reconstruction, there are no missed seeds in the CT reconstruction and the largest seed position error is reduced from more than 2 cm to about 2 mm. This clinical application minimized organ motion and metal artifacts to negligible levels. Additionally, a more accurate isodose distribution is easily registered to the anatomy, which is helpful for prediction of both tumor control and normal-tissue outcome.