AbstractID: 3163 Title: Study of the Technology of Pin-Point CT Imaging Guide System

Purpose:

The Pin-Point^{TM} is a technology for promoting accurate access to a designate target in the CT room, especially during biopsy procedures. This study is to confirm its capability by an independent methodology for clinical implementation.

Methods and Materials :

The Pin-Point system (FigA) is based on CT imaging with an invisible frame system and instant 3-D image reconstruction in the laser (needle insertion) plane as illustrated in FigB.

Two (yam and daikon) phantoms were used for the studies. The center portion of the phantoms was cut into ten 4mm thick slices. Simulated tumors were created on each slice using barium paste. Organs at risk (OAR) were carved with various shape cavities. BBs were attached as reference points (FigC).

Target searching and their correlation to the neighboring OARs were explored. An optimal "reference point R" was defined to serve as navigation for the laser-guided needle for start location, direction, and the needle depth to reach the targets and avoid OARs.

Results :

FigD demonstrates the needle reaching the tumor as navigated by the Pin-Point system. We oriented the guiding laser beam and pushed its path depth from point R to the tumor edge. Next the phantom slices were studied to determine needle positioning relative to the target and OARs, and compared with the foregoing CT image. The agreement is shown in FigD. FigE illustrates the optimal needle trajectory to 'tumor A', by-passing the OARs. FigF illustrates pre-warning of OARs. FigG displays the possibility of excessive needle penetration.

Conclusions:

Pin-Point system was accurate for correct tumor access without jeopardizing the nearby OARs. Our study proves valuable for the search of designated tumors and avoiding critical structures. In addition, its feasibility for further application to linac based stereotactic radiosurgery as frameless setup should be studied.