AbstractID: 7044 Title: Error Analysis of ortho-pair megavoltage registration of implanted markers to determine the position of the prostate - a monte carlo study

A method to determine the position of an organ when treating cancer with external beam radiation, is the implantation of radio-opaque markers combined with registration of these markers using an orthogonal (or other angles) pair of transmission radiographs.

In this paper we investigate the possible accuracy of such a technique to be used with megavoltage imaging. The errors introduced by determining the position of the seed on the film (user error), positioning of the imaging device with respect to the source (in the imaging plane as well as along the imaging axis) and the error in determining the angle between the two radiographs are just a few of the possible errors. This is specific for this problem as most portal imagers are attached to a gantry and a semi-rigid arm is used for positioning. We used a Monte Carlo technique to simulate the errors andcalculate how the errors propagated through the registration algorithm.

To reflect reality we selected images from a clinical study with prostate marker implants (6). Pooling several observers showed that they were able to pinpoint the seed positions with 0.45mm (1SD). Where 1.2, 1.2 and 2.3mm in the main directions. The high value in the last main direction which in this case was the up/down movement of the table was due to changes in the of pair selections making up a seed, which is done automatically.

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