

Migration of Radioactive Seeds and Tumor Motion after Transperineal

Permanent Prostate Implants

The positions of radioactive seeds implanted interstitially into prostate tissue are subject to motion after the implant procedure. The motion results from the changes in the shape and size of the gland in addition to individual seed migration with respect to the surrounding tissue. The changes in seed positions and the shape of the implanted domain were studied for a group of patients using the implanted I-125 seeds as multiple position markers distributed throughout the whole organ. Furthermore, the dosimetric consequences of the seed motion were also determined. The study was performed using anterior and oblique localization films taken immediately after the procedure and repeated a few weeks later. Large numbers of implanted seeds enabled both the whole organ motion (average seed shift) and its deformation (change of the distances between the seeds) to be distinguished. The whole organ motion (\pm one standard deviation) was (8 ± 6) mm, average individual seed shift was (7 ± 8) mm, and average implanted volume shrinkage was $(10\pm 12)\%$ in each dimension. This deformation (probably resulting from resolution of edema and tumor shrinkage) led to a $(8\pm 2)\%$ increase of the average dose. The method developed provides a useful tool for tracking both tumor motion and deformation. The postimplant seed migration observed has not been found to have a clinically significant effect on the dose distribution.