

AbstractID: 14133 Title: Electromagnetic Transponders Indicate Prostate Size Increase Followed by Decrease During and After a Course of External Beam Radiation Therapy

Purpose: Real-time image guidance enables more accurate radiation therapy by tracking target movement. This study used transponder positions to follow changes in prostate volume that may be a source of dosimetric and target inaccuracy.

Materials and Methods: Twenty-four men with biopsy-proven T1c-T3a prostate cancer each had three electromagnetic transponders implanted transperineally. Their coordinates were recorded by the Calypso[®] system, and the perimeter of the triangle formed by the transponders was used to calculate prostate volumes at sequential time points throughout the course of radiation therapy to a dose of 81 Gy in 1.8 Gy fractions. Following treatment, the transponder positions were determined once each month for six months.

Results: There was a significant decrease in mean prostate volume of 10.9 % from the first to the final day of radiation therapy. The volume loss did not occur monotonically, but increased in most patients (75 %) during the first several weeks to a median maximum on day 7. The volume increased by a mean of 6.1 % before decreasing by a mean maximum difference of 18.4 % to nadir ($p < 0.001$ for both increase and decrease). Glandular shrinkage was asymmetric with the apex to right base dimension varying more than twice that of the lateral dimension. For all dimensions, the mean change was < 0.5 cm. Following the course of radiation therapy, there was no further significant change over the ensuing six months.

Conclusion: Real-time transponder positions indicated a volume increase during the initial days of radiation therapy and then significant and asymmetric shrinkage by the final day. After the final day, the transponder positions remained nearly unchanged for six months.