AbstractID: 8765 Title: A Novel Approach To Patient-Specific Quality Assurance: Three-Dimensional Visualization And Verification Of Intensity-Modulated Treatment Plans Using Magnetic Resonance Imaging Of Polymer Gel Dosimeters

Intensity-modulated radiotherapy (IMRT) presents many challenges in the clinical setting, one of which is the verification of the treatment plan. Polymer gel provides a promising alternative to ion chamber or film dosimetry for this purpose, as it is possible to verify the dose distribution in an extended volume rather than at a single point or in a single plane. Irradiation of the gel causes the differential polymerization of acrylic monomers, and this polymerization in turn leads to an enhancement of the transverse relaxation rate (R2) of neighboring water protons. As the degree of polymerization, and the resulting enhancement of R2, is proportional to the absorbed dose, the dose distribution is contained in the differential pattern of R2 values. The gel is scanned twice using a 1.5 Tesla MRI unit, utilizing a Hahn single spin-echo pulse sequence. All scan parameters are kept constant with the exception of the echo time (TE), which is varied between the acquisitions. The two sets of images thus acquired are then processed with specially written software, which calculates the R2 maps in each plane, pixel by pixel. Once these maps are calculated, the relative isodose distribution may be viewed in any particular plane desired. The set of two-dimensional R2 maps can be used to construct an isodose surface display, which allows the three-dimensional visualization of the dose distribution. The power of this three-dimensional visualization can be exploited to allow the verification of IMRT treatment plans to a greater degree and in finer detail than previously possible.