

AbstractID: 4946 Title: Tumor Volume Regression during Radiation Therapy to Predict Treatment Outcome for Cervical Cancer

Purpose: To investigate the outcome predictive power of tumor volume measured by serial MR imaging (MRI) of cervical cancer, including the sensitivity and specificity to identify patients at risk of local failure.

Method and Materials: Seventy-nine patients with cervical cancer stages IB2-IVA, treated with radiation/chemotherapy (RT/CT), underwent serial MRI: MRI 1(pre-RT), MRI 2(at 20-25 Gy/2 weeks), MRI 3(at 40-50 Gy/4 weeks), and MRI 4(at 1-2 months post-RT). Mean follow up was 6.2 (0.2-9.4) years. Tumor volumes (V_1, V_2, V_3, V_4) and regression ratios ($V_2/V_1, V_3/V_1, V_4/V_1$) were measured by MRI 3D volumetry, and correlated with local tumor-control and disease-free survival using Mann-Whitney rank-sum test.

Results: The volume data collected in this study were analyzed and the predictive power in terms of p-value to discriminate local tumor-control and disease-free survival was computed. The absolute tumor volumes (V_2, V_3, V_4) and the regression ratios ($V_2/V_1, V_3/V_1, V_4/V_1$) strongly correlated with local tumor-control ($p < 0.001$). These parameters also correlated with disease-free survival, but only the last measurement (MRI 4) showed significant predictive value ($p = 0.02$). Four methods had been developed to identify patients at risk for tumor recurrence (sensitivity 61%-100% and specificity 87%-100%). The most powerful method is based on the volume regression measured in MRI 3 and MRI 4 ($V_3/V_1 > 20\%$ and $V_4/V_1 > 10\%$), which have a sensitivity of 89% and a specificity of 100%. Local failure can also be predicted as early as 2-3 weeks (MRI 2), the method of $V_1 > 40$ cc and $V_2/V_1 > 75\%$ shows a sensitivity of 61% and a specificity of 93%.

Conclusion: MRI-based volumetric tumor measurement provides important predictive information about tumor response to the ongoing RT/CT. The methods developed in this study demonstrate a high specificity (87%-100%) for patients at risk of local failure based on long-term follow-up. These methods may classify patients who require more aggressive therapeutic intervention.

Conflict of Interest (only if applicable): N/A