

## AbstractID: 10652 Title: When Tumor Repopulation Starts? An Outcome Analysis of Radiotherapy for Cervical Cancer

**Purpose:** The onset time of tumor repopulation remains an unsolved issue for cervical cancer, although 3–4 weeks have been assumed. The purpose of this study is to determine the onset time ( $T_k$ ) of cervical cancer based on an outcome analysis.

**Method and Materials:** A total of 80 patients with cervical cancer (stages IB2-IVA) were included in this study. Four sequential magnetic resonance imaging (MRI) scans were performed before, during and after radiation therapy (RT). The median follow-up time was 5.5 years (range 0.2–9.4 years). A kinetic model incorporating effects of radiation cell killing, dead-cell resolving, and tumor repopulation, was introduced to analyze tumor regression data measured by the MRI scans. A series of the onset time ( $T_k$ ) has been tested for outcome prediction. The derived radiobiological parameters, including cell surviving fraction of 2 Gy ( $S_2$ ) and dead-cell resolving half-time ( $T_{1/2}$ ), were correlated with clinical outcome using the Mann-Whitney rank-sum test.

**Results:** Both the model parameters,  $S_2$  and  $T_{1/2}$ , derived from regression data, correlated significantly with clinical outcome ( $p < 0.0001$ ). The corresponding p-values for outcome prediction were obtained as a function of the onset time. The optimal value of the onset time for best outcome prediction was  $T_k = 19$  days, with an uncertainty range of (14, 35) days. The outcome prediction power of  $T_{1/2}$  was superior to that of  $S_2$ , and more sensitive to the onset time of tumor repopulation.

**Conclusion:** The onset time of accelerated repopulation of cervical cancer was directly derived from the clinical data using a kinetic model. Our study showed that accelerated repopulation does exist in RT for cervical cancer and has a relatively short onset time. Therefore dose escalation is necessary to compensate the effects of RT protraction.