

## AbstractID: 14121 Title: Quantitative fat fraction change in pelvic bone marrow in response to concurrent chemoradiotherapy

**Purpose:** To quantify changes in pelvic bone marrow (BM) fat fraction (FF) during concurrent chemoradiotherapy for patients with pelvic malignancies.

**Method and Materials:** The study includes 6 patients with stage I-III cervical cancer and 4 patients with stage II-III anal cancer. For cervical cancer patients, treatment consisted of IMRT, 45 Gy in 1.8 Gy daily fractions with concurrent weekly cisplatin, followed by intracavitary brachytherapy boost. For anal cancer patients, treatment consisted of IMRT, 50.4-54.0 Gy in 1.8 Gy daily fractions, with concurrent 5-fluorouracil and mitomycin C. All patients underwent CT simulation and baseline quantitative FF magnetic resonance imaging (MRI) with the technique called Iterative Decomposition of water and fat with Echo Asymmetry and Least-Squares Estimation (IDEAL) within 3 weeks of initiating CRT. In addition, patients underwent mid- (week 3-4) and post-treatment (week 6-7) MRI-IDEAL scans. Rigid image registration was applied to the pre-, mid-, post- treatment FF image volume, using a commercial software Velocity AI (Velocity Medical Solutions, Atlanta, GA), to achieve accurate alignment and account for local heterogeneity in red BM.

**Results:** All 10 patients had the baseline MRI-IDEAL scans. All 6 cervical cancer patients and 3 anal cancer patients had mid-treatment scans. And 4 cervical cancer patients and 2 anal cancer patients had post-treatment scans. The mean pelvic bone FF of the cervical cancer patients at pre-, mid-, and post- treatment were 46%, 61%, and 72%, respectively. The mean pelvic bone FF of the anal cancer patients at pre-, mid-, and post- treatment were 63%, 72%, and 68%, respectively.

**Conclusion:** Pelvic BM FF increases significantly during chemoradiation for pelvic malignancies. As a putative indicator for functional BM, this imaging technique may be useful for guiding IMRT plans and for quantifying local changes in BM resulting from treatment.