(12-17 Gy) and the median depth was 0.9 cm (0.8-1.2 cm). The 6-MeV and 9 MeV electron were utilized in 28 (75.7%) and 9 (24.3%) patients, respectively. The median hospitalization after radiotherapy was 9 days. None of them had acute and late radiation-induced liver disease (RIL-D).Intrahepatic recurrence and extrahepatic recurrence were recorded in 14 patients (37.8%) and 3 patients (8.1%). There was no in-field failure. The 3-year overall survival (OS) and disease-free survival (DFS) were 84.8% and 45.5%, respectively. The results were preferable compared with historical data of narrow hepatectomy alone in our institution (3-year OS 74.5%, 3-year DFS 40.1%).

Conclusion: A single dose of 15Gy IOERT is efficient and safe, with favorable local control and survival in LCHCC after narrow hepatectomy. Further evaluation based on larger cases and longer follow up time is warranted.

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Tumor Necrosis Factor Receptor 1 Levels Predict Radiation Induced Liver Injury

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Purpose/Objective(s): Declining liver function is a concerning side effect associated with radiation therapy. Tumor necrosis factor receptor 1 (TNFR1) is a major receptor for TNF-alpha, a cytokine associated with liver injury. TNF-alpha is very labile, whereas TNFR1 is a stable marker of liver inflammation. In the current study, we tested the association between TNFR1 and liver injury in patients receiving radiation therapy to intrahepatic tumors.

Materials/Methods: Blood samples were collected prior to treatment and at 1 month after starting therapy. Enzyme-linked immunosorbent assay (ELISA) was performed to quantify plasma TNFR1 levels at each time point. Toxicity was defined as an increase in Child-Pugh score of 2 points or more within 6 months of starting therapy. We constructed univariate and multivariate logistic regression models to determine the association between TNFR1 plasma levels (log2-transformed) and toxicity. Multivariate models adjusted for baseline Child-Pugh score and biocorrected mean liver dose.

Results: Plasma samples were collected from 63 patients. Fifty-seven patients had hepatocellular carcinoma, 2 patients had cholangiocarcinoma, and 4 patients had liver metastases. Fifty-six patients received liver stereotactic body radiation therapy over 3-5 fractions and 7 patients received hypofractionated image guided radiation therapy over 12-20 fractions. Univariate analysis showed an association between liver toxicity and baseline TNFR1 plasma levels (odds ratio 5.2, $p=0.008$) and 1 month TNFR1 plasma levels (odds ratio 9.0, $p=0.005$). Multivariable analysis, incorporating baseline Child-Pugh score and biocorrected mean liver dose, also demonstrated a significant association between liver toxicity and baseline TNFR1 (OR 4.3, $p=0.033$) and 1 month TNFR1 (OR 8.2, $p=0.020$). Change in TNFR1 from baseline to 1 month was not associated with toxicity. Baseline TNFR1 plasma levels were also borderline significantly associated with overall survival (HR 1.8, $p=0.054$).

Conclusion: High plasma TNFR1 levels were significantly associated with liver injury in patients receiving ablative radiation to intrahepatic tumors. TNFR1 may be useful is personalizing radiation therapy for patients with hepatobiliary cancers. Agents that target this pathway are clinically available and may be useful in mitigating radiation induced liver injury.

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Tumor Response after Preoperative Chemoradiation Therapy with Simultaneous Integrated Boost Using Volumetric Modulated Arc Therapy in Locally Advanced Rectal Cancer

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Purpose/Objective(s): To retrospectively investigate the efficacy of preoperative dose escalation using simultaneous integrated boost with volumetric modulated arc therapy (SIB-VMAT), concomitant with capecitabine chemotherapy, in locally advanced rectal cancer.

Materials/Methods: Between February 2015 and October 2018, 87 patients with stage II-III rectal adenocarcinoma received preoperative 50.4 Gy to the pelvic lymph nodes and simultaneously delivered 56 Gy to the tumor, in 28 fractions, using SIB-VMAT, concomitant with capecitabine, 825 mg/m^2 bid. Tumor response rates were analyzed.

Results: Median age was 60 (18-85). Female/male ratio was 32/55. Tumor location was distal rectum in 32 (36.8%) patients, mid-rectum in 27 (31%), and proximal rectum in 28 (32.2%). All patients completed the treatment. Eighteen patients (20.7%) refused surgery or were medically inoperable. Sixty-nine patients underwent surgical resection. Median time to surgery from the completion of radiotherapy was 11 (6-55) weeks. Surgery was low anterior resection in 48 (69.6%) patients, abdomino-perineal resection in 19 (27.5%) and local excision in 2 (2.9%). Clinical ($n=14$) or pathological ($n=12$) complete response was achieved in 26 (29.9%) patients. Microscopic disease only ("a few tumor cells") was reported in 7 (8%) patients and tumor size less 5 millimeters in 5 (5.7%). Resection margins were free in all operated patients. Sphincter preservation rate for the distal rectal tumors was 43.8%, including five patients with clinical complete response. Metastatic pelvic lymph nodes were reported in 15 of 67 (22.4%) patients with lymph node dissection. Except diarrhea in three (3.4%) patients, which resolved after capecitabine discontinued, there was not any Grade ≥ 3 acute toxicity. Erectile dysfunction ($n=2$) or delayed surgical wound healing ($n=2$) was reported in 4 (5%) patients after surgery.

Conclusion: Preoperative radiotherapy with dose escalation using SIB-VMAT is well tolerated, with a low toxicity profile, and can achieve a high rate of clinical/pathological complete or near-complete response and down-staging in locally advanced rectal cancer patients. Further studies with larger patient number and longer follow-ups are needed.

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Insights from IGRT Credentialing for the NRG Oncology RTOG 1112 Liver Trial

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Purpose/Objective(s): NRG Oncology trial RTOG 1112 is a randomized study of sorafenib with or without stereotactic body radiotherapy (SBRT) for hepatocellular carcinoma. Image-guided radiation therapy (IGRT) credentialing is essential for this study due to the high doses, respiratory motion, and variety of delivery technologies. This analysis examines the IGRT credentialing experience.

Materials/Methods: Credentialing of volumetric IGRT for RTOG 1112 requires submission of planning and localization images, planning structures, and resulting IGRT shifts consistent with the study. A study reviewer