Purpose/Objective:
Objective: Patients with locally recurrent rectal cancer have severe morbidity and poor quality of life. Most are ineligible for surgery, and combined re-irradiation and chemotherapy provides limited symptom palliation and tumor control [1]. Clinical data suggests that adding hyperthermia to radiation improves tumor response [2]. However, past studies used invasive temperature sensors that were poorly tolerated and provided insufficient thermal dosimetry.

The objective of this study was to evaluate the feasibility in pigs of using MRI-HIFU to achieve mild hyperthermia in normal tissue targets that match typical locations for recurrent rectal cancer; and the quality of MR thermometry in consenting volunteers with biopsy-proven primary rectal cancer.

Materials and Methods:
Preclinical validation:
The feasibility of MR-HIFU hyperthermia was evaluated in a swine model (N=6, study approved by the Local Animal Care Committee). Imaging and hyperthermia were performed using a clinical MRI (Achieva 3T, Philips Healthcare) with an integrated MR-HIFU system (Sonalleve, Philips Medical Systems). Different targets at thigh muscle (at the rectal wall and deep locations) were evaluated. Thermal maps were acquired in 6 slices along the beam were obtained every 3.2s. Sonications were prescribed with 18 mm diameter treatment regions at 1MHz with target temperature of 42-42.5°C, for 10-60 min.

Human imaging study
The quality of MR thermometry of rectal cancers using MR-HIFU was evaluated with an imaging-only study (no heating) including 6 consenting volunteers with rectal cancer. This study was approved by the Sunnybrook Research Ethics Board. Anatomical and MR thermometry images were acquired using the same MRI and MR-HIFU system and parameters as in the preclinical study. In 3/6 subjects, rectal filling with 200-300 mL of saline was used to reduce motion-related artefacts in MR thermometry. Thermometry was performed in imaging slices located at the tumor.

Results:
Mean target temperature in the animal study matched the desired hyperthermia temperature to within 0.2°C, varying temporally with a standard deviation of 0.5°C or lower. No evidence of tissue changes were observed on contrast-enhanced imaging or at necropsy. The imaging study with patients showed that MR-based temperature remained stable especially when rectal filling was used to reduce bowel motion.

Conclusions:
Our preclinical validation study demonstrated that MR-HIFU can safely deliver mild temperatures of 41 to 43°C in a targeted volume for 30 minutes. Our clinical imaging study illustrates that with careful patient selection and preparation, the current MR-HIFU system may provide adequate treatment depth to target recurrent rectal cancers and sufficient MR temperature mapping stability for real-time control of mild hyperthermia exposures.

PO-0710
Clinical outcomes for inoperable HCC treated with SBRT: mono- institutional experience
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Purpose/Objective: Aim of this study is the evaluation of feasibility and efficacy of SBRT in the treatment of unresectable hepatocellular carcinoma (HCC).

Materials and Methods: Patients with 1-3 inoperable HCC lesions with diameter ≤6cm were treated by SBRT.
Prescription dose was 36-75Gy in 3-6 fractions. SBRT was delivered using the volumetric modulated arc therapy technique with flattening filter free photon beams. The primary end points of this study were in-field local control (LC) and toxicity. Secondary end points were overall survival (OS) and progression free survival (PFS).

Results: 43 patients with 63 HCC lesions were irradiated. All patients had Child-Turcotte-Pugh class A or B disease. Median follow-up was 8 months (range 3-43 months). Actuarial LC at 1 and 2 years was 86% and 64%. An Equivalent Dose >100Gy and GTV size were significant prognostic factors for LC in univariate analysis (p<0.001 and p<0.02). Median OS was 18 months. Actuarial OS at 1 and 2 years was 78% and 45%, respectively. Univariate analysis showed that OS is correlated with LC (p<0.04), BED>100 (p<0.05) and Cumulative GTV<5cm (p<0.04). Median PFS was 8 months, with a 1-year PFS rate of 41%. Grade ≥3 toxicity was observed in 7 patients (16%). No classic RILD was observed.

Conclusions: Our study show that SBRT is a safe and effective treatment for selected patients with inoperable HCC. Local control rates and toxicity profile were encouraging.

PO-0711 Prediction of response to neoadjuvant chemotherapy followed by chemoradiotherapy in rectal cancer by MRI volumetry
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Purpose/Objective: Chemoradiotherapy (CRT) followed by complete surgical removal is regarded as standard of care for locally advanced rectal cancer (LARC). To further improve clinical outcome therapeutic approaches may incorporate additional agents to the standard fluorouracil (FU)-based CRT. Intensified preoperative treatment with systemic neoadjuvant chemotherapy (NACT) before conventional long-course CRT has shown promising long-term outcome and acceptable safety profiles. However, at present, it remains challenging to reliably identify good and poor responders at an early stage in order to achieve more individualized, effective and less toxic treatment of these patients. In this study, the purpose was to investigate if magnetic resonance imaging (MRI)-assessed tumor volumetry predicts histologic tumor response to NACT and subsequent CRT in LARC.

Materials and Methods: The treatment in this experimental study consisted of two cycles of bolus 5-FU and oxaliplatin followed by long-course radiotherapy delivered concomitantly with capecitabine and oxaliplatin, before radical surgery. Complete MRI data sets and tumor histopathology from 69 prospectively enrolled patients were analyzed. Whole-tumor volumes were contoured in T2-weighted MR images obtained pretreatment (VPRE), after NACT (VNACT), and after the full course of NACT followed by CRT (VCRT). VPRE, VNACT, and tumor volume changes relative to VPRE, DVNACT and DVCRT, were calculated and correlated to histologic tumor regression grade (TRG).

Results: In total, 61% of good histologic responders (TRG 1-2) to NACT followed by CRT were correctly predicted by small pretreatment tumor volumes (VPRE < 10.5 cm³), large volume regressions after NACT (DVNACT > -78.2%), or small tumor volumes after NACT (VNACT < 3.3 cm³). Small pretreatment volume and large volume regression after NACT identified different patients; only six patients had both small pretreatment volume and large volume regression. Small tumor volume after NACT identified the majority of good responders (n = 27), with a sensitivity of 55.1% and a specificity of 100% (area under curve = 0.84), although the combined use of all three volumetric measurements identified the most. The volume regression after completed NACT and CRT (VCRT) was not significantly different between good and poor responders (TRG 1-2 versus TRG 3-5).

Conclusions: MRI-assessed small tumor volumes following NACT, before the commencement of CRT, predicted good histologic tumor response (TRG1-2) to the completed course of NACT and CRT with high accuracy. Further, the combined use of tumor volume measurements before, during, and after NACT identified most good responders. MR volumetry may be used to improve individualized, multimodal treatment of LARC.

Poster: Clinical track: Genitourinary (prostate included)

PO-0712 Role of 3T multiparametric MRI in the detection of local recurrent prostate cancer after radical prostatectomy
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Purpose/Objective: To evaluate the role of 3T multiparametric MRI (3TmMRI) without endo-rectal coil (ERC) in the detection of radiographic local recurrences (rLR) in a contemporary cohort of patients with prostate cancer treated at our hospital and who presented a biochemical recurrence after PR with low PSA levels and to identify clinical parameters associated with the findings of the 3TmMRI.

Materials and Methods: Between 2009 and 2013, 57 patients with biochemical recurrence after RP of a PC and considered for salvage radiation therapy (SRT) were included. 3TmMRI with T2-weighted imaging (T2WI), diffusion weighted imaging (DWI) and dynamic contrast-enhanced images (DCE) without ERC was carried out in all the patients prior to treatment. Given that there are no validated criteria, a points system was established to define the findings of the 3TmMRI, 0 being (normal); no abnormality was observed in the MRI sequences: T2WI, DWI or DCE), 1 being (doubtful); an abnormality was detected in one of the MRI sequences, with no correlation in the rest of the sequences) and 2 being (abnormal); abnormality detected in all or in two of the sequences). The local relapse was defined as 2. To analyze the relationship