**ABSTRACT SUBMISSION FORM**
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The submission is to be considered in the following category
- ☐ Oral presentation preferred
- ☐ Poster presentation only

Trainee status
- ☐ I am a trainee (student or postdoctoral fellow)
- ☐ I wish to be a candidate for best student paper/poster

**PRESENTATION TITLE**
Experiences of MR simulation as an enabler for Liver SABR

**AUTHOR(S)**
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**ABSTRACT**
Please type in your abstract up to a MAXIMUM of 500 words. Figures may be included.

**Purpose:**
In March 2017 our centre started delivering Liver SABR for patients with primary Hepatocellular Carcinoma (HCC) and Oligometastases (≤3metastases) in the NHS England Commissioning-through-Evaluation (CtE) program. Prior to SABR availability, these patients were considered for palliative systemic therapy or best supportive care. This abstract documents our initial experience from 10 patients and how MRI has enabled the treatment technique.

**Materials & Methods:**
Patients are prescribed 40-50Gy/5# treated with 6MV FFF VMAT, with dose adapted to meet OAR constraints. Both treatment position CT and MRI are acquired using MRI safe Bionix Wingboard, ProStep knee support, Bodyfix vacbag and CIVCO Pro-Lok Abdominal compression.

All simulation is scheduled on the same day (where possible) and consists of 3D-CT and 4D-CT (to determine GTV-ITV margins) on a Siemens Sensation Open (Siemens Healthcare, Erlangen, Germany) as well as MRI using a 3D spoiled gradient echo sequence on a Siemens Aera 1.5T (Siemens Healthcare, Erlangen, Germany). Slice thickness for CT and MRI are 2 and 2.5mm respectively. All 3D imaging is acquired in exhale breath-hold and patients receive multiphase contrast-enhanced scans on CT or MRI (using Omnipaque 300 (GE Healthcare, Chicago, USA) or Primovist (Bayer-Schering, Berlin, Germany) respectively) dependent on contraindications.

3D-CT and MRI scans are rigidly registered in Monaco v5.1 (Elekta, Stockholm, Sweden). The clinician selects the contrast-enhanced phase used. Registrations are optimised hierarchically by performing: whole FOV automated registration; automated registration in a ROI including whole liver (or part of liver as required); manual optimisation if required. Clinicians use MRI and CT imaging to contour the GTV and OARs respectively.
Results:
We have treated 7 HCC and 3 oligometastatic patients. One HCC patient couldn’t have MRI due to a pacemaker and two oligometastatic patients didn’t require MRI as lesions were visualised well on CT. All remaining patients couldn’t have been treated without GTV definition on MRI, example shown in figure 1. To date fatigue is the main reported toxicity (Grade1-2, with one case grade3), no other grade3+ toxicities have been recorded. One oligometastatic patient died 3.5 months post treatment from further metastases. Three patients have had follow up imaging and with 2 complete responses and one partial response in treated lesions (example shown in figure 2).

Specific problems encountered during simulation imaging have been: patients (typically those with co-morbidities) not being comfortable in the treatment position for both CT/MRI simulation in a single day; unacceptable/poor rigid registration between CT/MRI (one due to breath-hold inconsistency between CT/MRI and one due to CT/MRI being acquired 3 days apart); optimisation of abdominal compression position to reduce tumour motion significantly whilst not limiting imaging (MRI surface coil position or on-treatment imaging); 2 patients not suitable for abdominal compression due to patient size; and production of vac bag so it doesn’t limit earphones for MRI simulation.

Conclusions:
In our experience liver SABR has been well tolerated by patients, shows encouraging initial toxicity/follow up results and provides a further potential treatment option for patients. In 7/10 cases SABR treatment wouldn’t

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have been possible without access to MRI simulation alongside CT.