Background Despite advances in therapy, the prognosis of hepatocellular carcinoma (HCC) remains poor. The introduction of biologic drugs, including immune check-point inhibitors, has revolutionized HCC treatment. However, only a portion of patients with HCC respond to immunotherapy and predicting response is an unmet need. In this preliminary study, we assessed the value of quantitative multiparametric MRI (mpMRI) for predicting HCC response to neoadjuvant immunotherapy.

Methods In this prospective IRB-approved single-center study, we included 17 patients (M/F 14/3, mean age 65y) with resectable HCC who underwent mpMRI including T1 mapping, 3D MR elastography (MRE), diffusion-weighted imaging (DWI), and dynamic contrast-enhanced (DCE)-MRI with a hepatobiliary contrast agent (gadoxetic acid, Eovist/Primovist, Bayer), at pre-treatment and after completion of anti PD-1 immunotherapy (cemiplimab) as part of a trial. All patients underwent surgical resection. HCC lesions were identified by an experienced radiologist and regions of interest were placed to measure tumor native and post-contrast T1 measured during hepatobiliary phase (T1-HBP), tumor stiffness (TS), apparent diffusion coefficient (ADC), and perfusion parameters. The reference standard was the histopathologic percentage of necrosis. Patients with significant tumor necrosis (STN ≥50%) were considered responders. MRI parameters were compared between responders and non-responders by Mann-Whitney U test, and their diagnostic performance to predict response to treatment was assessed by ROC analysis.

Results 17 HCC lesions (6.4±4.9 cm, range 2.0-19.0 cm) were resected in 17 patients. At pre-treatment MRI, tumor native T1 and upslope from DCE-MRI were prolonged in responders compared to non-responders, and predicted response with good diagnostic performance (table 1; T1 AUC(CI)=0.82(0.58-0.99), upslope AUC(CI)=0.80(0.58-0.99). The other parameters had no value in predicting response to immunotherapy (AUC range 0.52-0.68). Tumor native T1 and T1-HBP increased with degree of tumor necrosis at resection (%).

Conclusions Our results demonstrate the potential utility of native T1 and upslope measured with DCE-MRI for predicting HCC response to neoadjuvant immunotherapy. These findings require validation in an independent study.

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Trial Registration Neoadjuvant Cemiplimab for the Treatment of Resectable NSCLC, HCC, and HNSCC clinicaltrials.gov identifier NCT03916627

Ethics Approval The study obtained continuing approval from the IRB at Mount Sinai through 01/19/2023, for Regeneron Pharmaceuticals, Inc. Protocol # R2810-ONC-1866/PI: