

SHARMA Rohini EOI 2022 – Imperial

Project title: Radiogenomics and hepatocellular cancer

Project Summary:

Imaging forms the fundamental basis of both the diagnosis and management of hepatocellular cancer (HCC). Radiomics quantifies the mesoscopic tumor phenotype from anatomic or functional images by defining tumor spatial complexity generating disease features not appreciated by the naked eye. Building on our expertise in both HCC and radiomics, this PhD proposal will combine integrated research questions to provide the successful student the fundamental knowledge and skills in this area.

1. Radiomic Predictors treatment response: SORAMIC dataset
The SORAMIC study was a randomized phase III study of selective internal radiotherapy combined with the systemic agent, sorafenib (n=216) versus sorafenib alone (n=208). Working with the Department of Engineering and physicists within our group, we will develop an autosegmentation approach to be applied to MRI images. The student will use this to segment HCC and surrounding normal tissue. They will learn the relevant preprocessing skills required prior to extraction of radiomic features. They will then use software to extract radiomic features. The student will be taught relevant statistical modelling that will be applied to the extracted features. The ability of the extracted features to predict PFS and RECIST response will be reported. The student will also derive a CT predictive signature which will be compared with the MRI signature from the same dataset.
2. Radiogenomic signature predictive of surgical outcome
70% of patients undergoing curative resection will recur within 5 years. There are currently no predictive biomarkers of disease recurrence. The Imperial tissue bank has 120 HCC resection specimens. Long term follow-up is available. The student will extract both RNA and DNA for untargeted sequencing (BRC Genomics Facility). Pre-operative imaging will be obtained and using the autosegmentation tool developed, tumour volume of interest will be extracted. Radiomic features predictive of relapse free survival will be derived from both tumour and surrounding liver, and combined with a genomic material to derive a radiogenomic signature predictive of outcome (collaboration Prof Glen, Dept Metabolism, Digestion Reproduction). In a subgroup of patients (n=30) circulating tumour DNA (cfDNA) will be extracted and targeted sequencing conducted. Samples for these patient have been collected every 3-6months from surgery. cfDNA will be combined with extracted radiomic data at each time point to derive an early predictor of disease recurrence.

Supervisory Team:

- Dr Rohini Sharma, Medicine, Imperial College London
- Prof Eric Aboagye, Imperial College London
- Dr Ben Glocker, Imperial College London

Clinical Specialities: hepatology, radiology, surgery, oncology