



RESEARCH TOPIC MEM1

Radiomic features of tumor and of liver-tumor interface in patients with colorectal liver metastases

Curriculum MEM Clinical

Clinical Unit name and address

Department of Surgery - IRCCS Humanitas Research Hospital

Laboratory name

Advanced clinical imaging and analyses lab, IRCCS Humanitas Research Hospital

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Abstract

Background: Liver metastases (CLM) affect about half of patients with colorectal cancer and dictate patients' prognosis. Prediction of prognosis is of paramount importance for patients allocation to the most adequate treatment, but available parameters do not adequately fulfil this role. Tumor pathology and molecular data and liver-tumor interface characteristics showed a major prognostic impact, but they are not included in standard prognostic scores and standard imaging modalities are poorly informative about them. Radiomic analyses demonstrated a very good prediction of pathology data and of patients outcome in several tumor, but their application to CLM remains to explore.

Hypothesis: The preoperative identification of CLM and liver-tumor interface characteristics would improve prognosis prediction and patients allocation to treatments. As in other tumors, radiomic analyses could allow a major refinement in prediction of pathology data. Radiomic features per se could have a major association with prognosis.

Aims: The study has the following end-points:

- to assess whether radiomic features of tumor and of liver-tumor interface improve prognosis prediction in CLM patients undergoing liver surgery in comparison with standard prognostic scores.
- to explore if radiomic features are associated with pathology data.
- to explore performances of radiomic features in comparison with standard radiologic criteria to assess tumor response to chemotherapy.
- to merge radiomic and detailed pathology data in a single prognostic score.

Experimental Design: The study will combine a retrospective (n=300 patients) and a prospective (n=400) series of patients undergoing liver resection at authors institution. Retrospectively collected patients will represent the training dataset for the prognostic model including standard prognostic factors plus radiomic features, while the first half of the prospective cohort (n=200) will be the validation dataset (minimum follow-up 30 months). For the analysis of association of radiomic features with pathology details and tumor response to chemotherapy, the prospective cohort of patients (n=400, ~800 CLMs) will be used as training and validation dataset (data about liver-tumor interface cannot be reliably assessed in the retrospective series). Finally, all prospectively collected patients with adequate follow-up will contribute to build a composite prognostic score combining radiomic features and detailed pathology data.

Per-patient evaluation will be performed in prognostic analyses; per-lesion evaluation will be performed while evaluating the association between radiomic and pathology data. The LifeX[®] software will be used to perform radiomic analyses. The volume of interest (VOI) of the tumor will be tracked. An automatic volume expansion will be applied to the tumor VOI to track the liver-tumor interface (expansion of 5 mm).

Expected Results: The present study has the solid expectancy to demonstrate that radiomic features of CLM and of liver-tumor interface have a major prognostic role and a good association with pathology data. We further believe that a prognostic score combining radiomic and pathology data may further optimize prognosis prediction.

Impact On Cancer: Our analysis aims to improve CLM prognosis prediction by identifying radiomic features that impact prognosis and predict pathology data, and to propose a combined prognostic model of radiomic and pathology data. These are the basis for a precision medicine based on a preoperative prognostic-driven treatment allocation.

Main technical approaches

The PHD student will work on radiomic analyses under the supervision of Prof. Chiti and Prof. Viganò. He/she will select imaging modalities to analyze, and will perform radiomic analyses. In addition, he/she will be in charge of patients enrollment and follow-up evaluations. He/she will collect data, and will contribute to abstract and manuscript drafts.

Scientific references

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Fiz F, et al. Radiomics of Liver Metastases: A Systematic Review. Cancers. 2020; 12: 2881.

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Type of contract

Contract for continuative and coordinated service of at least € 26.000 activated Istituto Clinico Humanitas. This sum is subject to IRPEF income tax.

Contratto collaborazione coordinata e continuativa (cococo) pari ad almeno € 26.000 annui lordi attivato da Istituto Clinico Humanitas. Importo soggetto a tassazione IRPEF.