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Screening for molecular signatures of radiotherapy and immune system activation in Breast Cancer: a spatial multi-omics approach applied to ex-vivo cancer samples

The IMAGEOMICS Project (co-funded by the European PIANOFORTE partnership) aims to improve the benefit/risk ratio of breast-cancer (BC) radiotherapy, focusing on immune system activation by radiation. A work-package is dedicated to the identification of molecular changes in the tumor micro-environment after radiation, using high-throughput Spatial-Omics techniques.

To this aim, we will collect BC resections of patients undergoing surgery at Fondazione IRCCS Policlinico San Matteo; from each tissue volume, two samples will be prepared: one irradiated with 5Gy-Xray, the other retained as control. After 24 hours from the treatment, samples will be fixed and processed for Spatial Proteomics (Akoya) and Spatial-Transcriptomics (VISIUM HD).

We will acquire bioinformatics data on transcripts and 27 protein-markers (preserving spatial information) and perform differential expression analysis, to finally identify molecular pathways in radiotherapy response and immune modulation. This approach can significantly contribute filling the lack of knowledge in aggressive BC subtypes such as Triple-Negative BC.

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