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Molecular Imaging is the Key Driver for Clinical Cancer Diagnosis in the Next Century!

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Many molecular events and multiple mechanism are involved in the process of cancer development. An important aspect does not only understand the molecular mechanisms, but also the application of this knowledge in order to assess the status and treatment of cancer.

In this view, the discussion about the importance of molecular cancer imaging is rising up and is getting more into clinical focus.

New advances in cancer imaging are improving our ability to detect early-stage disease to monitor treatment outcomes and to support the development of non surgical ablation techniques.

In the last decades, important development of new biomedical imaging methods were implemented, for example new promising PET tracer, ultrasound probes for tumor vascularisation or MRI using manganese as diagnostic agent for the early stage of breast cancer [1].

In this revolution, the important question is: is it possible to find the crucial biomarker for cancer diagnosis and treatment in order to develop specific probes for tumor imaging? How much time will take these studies to be translated into the clinic?

The metabolic changes induced by new treatments modify the biology and behaviour of the tumor creating a discrepancy between the patient's clinical condition and the response measured by RECIST (Response Evaluation Criteria In Solid Tumors) [2].

In the so called era of "theranostic", nuclear medicine by PET-CT, is already able to offer a clinical molecular diagnosis to patient [3]. Functional imaging by magnetic resonance (MR), such as MR spectroscopy (MRS) and Diffusion Imaging (MR-DWI), could be perfectly applied into clinic on breast and prostate cancer [4-6]. A promising example is the molecular imaging study of calcium sensing receptor (CaSR) expression on breast cancer [7].

Currently the data coming from studies on molecular imaging are still not fully validated for clinical diagnosis.

For this reason it's demanding to create the strong bridge between the medical scientific community. The interaction of radiology, nuclear medicine and biology is absolutely necessary regarding the clinical focus and to accelerate the transformation of molecular imaging from an utopia to a close frontier for patient [8].

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