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TRUS_Tof_PET Project

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The most certain diagnosis of prostate cancer is based on histopathology analysis of biopsy samples. Biopsy decision is based on highly non-specific elevated PSA (Prostate Specific Antigen) factor in blood. Currently biopsy is realized with use of TRUS. Samples are taken by ~2mm biopsy needle. TRUS is not sensitive for small cancer lesions, therefore it is generally used for biopsy needle location control only. During standard biopsy about 12-14 samples are taken from statistically distributed sites. Therefore this kind of biopsy is called "blind". Negative result cannot confirm absence of the cancer. If PSA remains elevated the biopsy procedure is repeated up to a few dozen times. Multiple biopsies expose patients to potential complications and diminish life quality, and what is most important, cause delay in therapy until first positive evidence of cancer is acquired. And quick and accurate therapy is the best way to fight with prostate as well as other cancers. We propose a hybrid system of external PET detectors and TRUS probe integrated with detector-probe PET and with biopsy needle. Combined with the new more specific PET imaging agents for the prostate cancer, the proposed improved biopsy system will not be "blind"anymore, but guided by the molecular PET images. We expect that the diagnosis process will be shortened: the number of biopsies will diminish from a few dozen to hopefully only one to a few, while the number of punctures will diminish from a few hundred to several. This approach will substantially enhance the efficacy of the biopsy procedure and accelerate the beginning of treatment. Additional challenge is to achieve the MR-compatibility, with MRI currently being the best choice to obtain structural information in case of the prostate, due to its soft tissue differentiating power. Therefore, our system will be constructed from MR-compatible components. From the beginning we initiated discussions with the urologists to set optimal requirements and to participate in the design of the system and the protocol. During multi-center clinical trials the optimal examination protocol will be prepared, and optimal PET radiopharmaceutical will be defined. Also industrial partners were invited to join and play an important role in the development, to facilitate the translational process resulting in a practical marketable system. Our success will be judged by the acceptance by the urologists and ability to convert into marketable clinically useful system.

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