Franziska Loebel: Correlation of Metabolomic Profiles and Immunohistopathology of Prostate Cancer Tissue

AIM: To investigate if metabolomic profiles of prostate cancer tissue established with HRMAS 1HMRS show a correlation to the Immunohistopathology of the same samples, allowing to conclude the pathology of a tissue sample from the spectroscopy results.

MATERIAL & METHODS: Samples: 51 prostatectomy samples of biopsy-proven prostate cancer patients, provided by the Department of Urology of MGH, Boston, MA, USA

1. Magnetic Resonance Spectroscopy: BRUKER 14T spectrometerImmuno histochemistry (IHC) AMACR (P504S) antibody (stains cancerous prostate epithelium cells)
2. CK903 (High molecular weight cytokeratin) antibody: stains cytoplasma of benign epithelium cells
3. P63 antibody (stains nuclei of benign epithelium cells)

PRELIMINARY INVESTIGATIONS: To be able to correlate the spectroscopy results with the immunohistopathological results of the samples, we had to make sure that undergoing spectroscopy does not affect the outcome of the pathological analysis.
For 14 out of the 51 samples we did a comparison of the immunohistochemical result of imaged (processed with spectroscopy, then fixed, embedded and stained) versus non-imaged (instantly fixed, embedded and stained) sample part for all three antibodies.
The investigation showed that there were no differences in the outcome of IHC for AMACR and CK903, whereas the quality of the IHC with P63 performed was worse on the imaged samples. This indicated that AMACR and CK903 can be used on imaged samples to determine the Immunohistopathology.
MAIN PROJECT: On all 51 samples, HRMAS 1HMRS was performed, using the BRUKER 14T spectrometer. Following the spectroscopy, the samples were fixed, embedded in paraffin and cut. Immunohistochemical staining was performed on three subsequent slides with the three different antibodies using a previously established immunostaining protocol. The slides were photographed. For a quantitative pathology evaluation, we needed a program that could determine the percentage of cancerous versus benign tissue. This program was computed with the help of Yannick as part of his project.
The spectroscopy data was evaluated using NUTS and a Principal Component Analysis. So far, the evaluation of the data has been finished. The correlation still needs to be done.
OUTLOOK: We expect the quantitative pathology analysis to correlate with the spectroscopy results. In case that the correlation of histopathology and spectroscopy results would be significant, it would be possible to establish an algorithm that could determine whether a spectroscopy result indicates high grade or low grade cancer or benign tissue. Metabolomic profiles for high- grade, low- grade cancer or benign prostate hyperplasia could be established. These profiles could be used in in-vivo diagnosis of prostate cancer and also help the patients decide if surgery needs to be done.