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BACKGROUND: Biochemical recurrence of prostate cancer, i.e. the rise of serum PSA values after radical prostatectomy, is an epidemiologically common and clinically threatening phenomenon in the course of treatment of prostate cancer. To date, clinicians have no effective tools at hand to estimate the likelihood of recurrence and to adapt the protocol of treatment and surveillance accordingly. In a previous study, High Resolution Magic Angle Spinning 1H Magnetic Resonance Spectroscopy at 14T was used to establish profiles of recurrent versus non-recurrent experimental groups yielding a 78% accuracy of distinction between the groups. **METHODS:** 50% of the cases (n=16) of this preceding radiological study were randomly selected for molecular biological examination: Inspired by the reported relation between spermine and prostate cancer, the mRNA of four enzymes of the polyamine pathway, namely ODC, Ado-MetDC, SSAT and OAZ, were quantified using Laser Capturing Microdissection and Real Time Polymerase Chain Reaction on needle biopsy specimens.
RESULTS: Like the metabolomic profiles previously acquired through HRMAS 1H MRS, the gene expression levels acquired through qPCR can distinguish between recurrent and nonrecurrent cases. We found statistically significant group mean differences for two of the individual enzymes (AdoMetDC and OAZ) and established a linear model combining the four pathway enzymes that clearly differentiates between the recurrent and non-recurrent cohort ($p = 0.0004$). In addition, we found that the variation in tissue enzymatic profiles can explain some of the variation in the HRMAS 1H MRS metabolomic profiles detected in the preceding study.
CONCLUSIONS: This study supports the view that prostate cancer, and prostate cancer recurrence in particular, is intimately linked to spermine and the polyamine pathway. It also supports the hypothesis that changes in gene expression that occur in patients with prostate cancer relapse after radical prostatectomy match changes in the metabolom. While recognizing its limitations, the present study demonstrates the potential of enzymatic and metabolomic profiles as clinical tools. With further development still necessary, they may in the future serve as predictors of biochemical recurrence and metastatic progression, and as such assist clinicians with surgery choices and the selection of adequate post-surgery monitoring regimes.