P084 Application of Raman spectroscopy coupled with chemometrics to the early diagnostics and classification of prostate cancer

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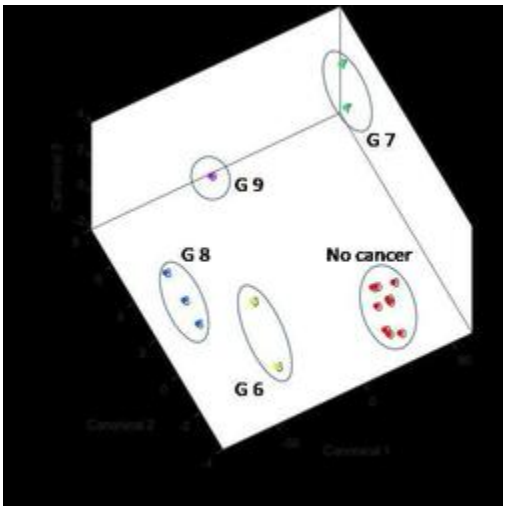
Introduction & Objectives: Raman spectroscopy is a non-destructive vibrational molecular spectroscopy, very sensitive to chemical changes in complex samples. Assigning specific chemicals or molecular attributes to Raman spectra of a biological sample can be cumbersome, and such approaches have largely been supplemented by chemometric ones. Chemometrics tools allow to define groups of samples characterized by specific chemical changes. Our hypothesis is that the onset of prostate cancer (PCa) and its evolution lead to variation of specific components, and such variation could be detected and identified by Raman spectroscopy, in order to classify the sample into predefined clinical groups.

Materials & Methods: A total of 20 urine sample coming from patients with clinically localized PCa, prostate benign hyperplasia (BPH) or atypical small acinar proliferation (ASAP) were selected for study. Samples were analyzed by Raman spectroscopy and the spectra were recorded and analyzed by principal component analysis (PCA). Discriminant analysis of principal components (DAPC) were applied to the set of data classified into a priori groups based on experimental factors, to provide a visual interpretation of the relationships among those groups. The classification factors were the general diagnosis (no cancer, PCa or ASAP) and the Gleason stage of PCa.

Results: The analysis and data clustering by DAPC showed distinct canonical contributions, resulting of different fractional contributions of each principal component of the spectrum (resulting of one of several molecular contributions). Hence, it is possible to classify the samples depending on the presence of PCa, ASAP or absence of PCA. Also, samples could be classified according Gleason stage, with long canonical distances, suggesting that molecular changes resulting of the clinical state are strong, measureable and predictable, i.e., one or several unidentified molecules are giving rise to cluster separation in DAPC 3-D representation (Figure 1). Provided a knowledge of the urine metabolome, canonical contributions can be used to discover how the urine chemical space is changing in response to prostate pathology and to develop new diagnostic tools.



Conclusions: Raman spectroscopy could be used as a reliable, fast and affordable diagnostic tool for PCa, the chemometrics study of Raman spectrum could be key in the identification of new prostate cancer biomarkers.