ROLE OF VIBRATIONAL SPECTROSCOPY IN THE EARLY DETECTION OF GLAUCOMA

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Background

- Glaucoma is slowly progressive optic neropathy resulting in visual field damage and decrease in visual acuity.
- There is currently no glaucoma screening method available and no glaucoma-specific biomarkers identified yet.
- FTIR spectrum is composed of specific vibrational modes that are unique to molecular structures

Material & Methods

- Aqueous humor samples were surgically taken from 80 age matched subjects from UHC Sestre milosrdnice, divided into two groups; glaucoma patients and a control group with cataracts.
- Samples were recorded using FTIR spectroscopy (transmission mode) and Principal Component Analysis (PCA) was performed on obtained spectra

Results

- The necessary information for the differentiation between aqueous humor samples from patients with glaucoma and cataract is based on their biochemical content which generates small differences in their infrared spectra (i.e., intensity, bandwidth, and spectral position of the vibrational band).
- The result of PCA modeling show a correlation in vibrational spectra of aqueous humor from patients with glaucoma, as well as differences in spectra between them and the control group.
- The created PCA model was succesfully validated by extracting 15% random spectra as a testing set; all unknown spectra were correctly placed in their distinct group, although there is a small overlap for several spectra from patients with glaucoma.

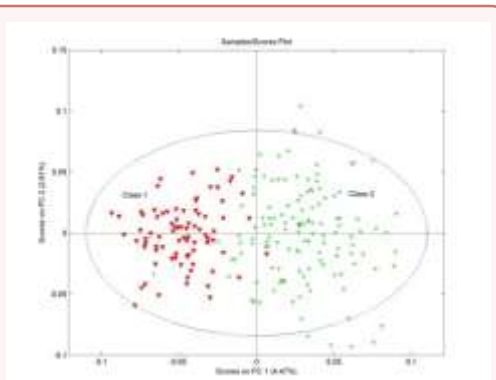

Figure 1. PC1-PC2 scatter plot as a result of PC analysis with all recorded FTIR spectra. Red triangles represent the FTIR *spectra of patients with cataract* and green stars represent the *spectra of patients with glaucoma*.

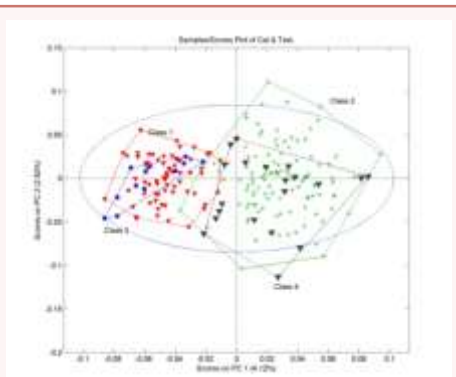

Figure 2. PC1-PC2 scatterplot of the PCA model and its validation. Red triangles and green stars represent *cataract and glaucoma*, respectively (model spectra), while blue squares and black triangles represent *cataract and glaucoma*(validation spectra).

Conclusion

- Preliminary results demonstrate the feasibility of using FTIR spectroscopy combined with principal component analysis for distinguishing *patients with glaucoma from patient with cataract* by recording surgically obtained aqueous humor.
- PCA modeling confirmed the existence of spectral difference between samples and validation of the created PCA model with randomly chosen spectra satisfactorily follows the initial result.
- Additional spectra recording is currently underway in order to increase to accuracy of the PCA modeling.