

Experimental Diagnostic Investigation of Colorectal Polyps for Malignancy Using Raman Spectroscopy

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Background: Raman spectroscopy is a non-destructive optical technique providing molecular information based on the biochemical composition of biological tissue. Its potential as a complementary diagnostic tool for the characterization of colorectal polyps is currently being investigated.

Objective: This ongoing study aims to evaluate the feasibility of Raman spectroscopy for the analysis of colorectal polyps obtained during routine colonoscopy. Particular emphasis is placed on the quality, consistency, and suitability of the acquired spectral data for subsequent diagnostic analyses.

Methods: Residual tissue from colorectal polyps removed during routine colonoscopy is analyzed using Raman spectroscopy. The diagnostic portion of each specimen continues through the standard histopathological workflow without modification. To date, 40 patients have been included in the study. An initial analysis of the acquired Raman spectra was performed to assess data quality, measurement consistency, and the suitability of the data for further statistical and diagnostic evaluation.

Results: Raman spectra were successfully acquired from colorectal polyp specimens within the clinical workflow. The initial analysis demonstrated good overall spectral data quality, with a substantial proportion of spectra suitable for further processing and analysis. The acquired data showed sufficient consistency to establish a reliable analytical workflow for subsequent investigations. At this stage, the analysis focuses on spectral quality and data robustness. Comparative analyses between malignant and benign lesions are ongoing.

Conclusion: The preliminary findings demonstrate the feasibility of acquiring good-quality Raman spectroscopic data from residual colorectal polyp tissue during routine clinical procedures. The results provide a solid basis for subsequent analyses investigating spectral characteristics associated with tissue malignancy. Further recruitment and analysis are ongoing.

Biosketch

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CURRENT AND PAST POSITIONS

01/10/2023–present: Resident Physician, Hôpitaux Robert Schuman, Luxembourg.

19/05/2018–19/05/2023: Scientist, Luxembourg Institute of Health, Luxembourg.

31/12/2012–30/12/2017: Postdoctoral Researcher, Luxembourg Center for Systems Biomedicine, Luxembourg.

14/03/2013–14/07/2015: Postdoctoral Researcher, University of California San Diego, San Diego, USA.

31/08/2012–30/12/2012: Postdoctoral Researcher, Zurich, Switzerland.

30/11/2007–30/08/2012: Research Assistant / PhD Student, ETH Zurich, Switzerland.

30/11/2006–29/11/2007: Research Assistant / Master Student, University of Innsbruck, Austria.

2001–2006: Research Assistant, Albert Ludwig University of Freiburg, Germany.

EDUCATION

Diplombiologe, Freiburg, 2007.

Dr.sc.ETH, Zurich, Switzerland, 2012.

Arzt (Approbation in medicine), Homburg, Germany, 2022.

AWARDS AND HONORS

This work is supported financially by the programme de recherche clinique hospitalière of the Luxembourg Ministry of Health.

OTHER RELEVANT PROFESSIONAL ACTIVITIES AND ACCOMPLISHMENTS

Extensive experience at the interface of medicine, biomedical research, imaging, systems biology, and tumor diagnostics.

University teaching experience in molecular biology, molecular medicine, imaging-based systems biology, and related biomedical disciplines at the University of Luxembourg and ETH Zurich.

(Co-)Supervision of PhD, MD, Master's, and Bachelor's theses.