

Need for early, minimally-invasive cancer diagnosis

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Dear Editor,

We have read the article by Mittal et al. (1) and we would like to congratulate the authors for an excellent piece of work demonstrating spectroscopy's capability for accurately subtyping epithelial cells and the tumor-associated microenvironment. Herein we would like to add some insights and comment on how this work could take the field forward.

In this recent paper, a high-definition Fourier-transform infrared imaging method using a quantum cascade laser (QCL) source has been employed for the characterization of 100-case breast tissue samples. This advancement has the potential to facilitate label-free molecular histopathology and bring spectroscopy one step closer to the clinic: undoubtedly, this study would be of great benefit with regards to expediting the diagnostic workflow as well as in terms of saving the pathologist's and / or surgeon's precious time and caseloads - not to mention providing high-quality data. Having said that, the most critical point with regards to patient benefit still remains unanswered:

"Could this technique be used for improving cancer patients' prognosis and survival?" "Could this method allow for an earlier, non-invasive diagnosis while there is still room for timely intervention and favorable outcomes (2, 3)?"

For instance, the technological development of hand-held spectroscopic devices and fiber optics has previously shown tremendous promise when it comes to characterization of cancer and could be used for *in-vivo* diagnostics without the need for tissue resection (4-6). Recent studies have also shown the promise of biological fluids for a minimally-invasive and pre-symptomatic cancer detection (7-9). Different types of machine learning algorithms have been developed to interpret spectroscopic data (10) with the aim of detecting cancer. A major field will be the development of predictive algorithms in order to identify pre-symptomatic cases that are destined to develop the disease; this would allow earlier intervention.

The results presented in this carefully-conducted work are undeniably a progressive step towards an accurate and differential diagnosis; however, we also propose that further spectroscopic / clinical research should focus on the development of screening tools for an earlier and minimally invasive detection of cancer.

References

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