Intraoperative brain cancer detection with Raman spectroscopy in humans

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The early cancer detection provides us an opportunity to select proper treatment and follow up survival. Molecular events occurring in tumors frequently constitute early events of carcinogenesis and can be detected much before clinical cancer diagnosis. On several occasions, few invasive cells remain after brain surgery in patients with brain cancer and there is a need for such tools which can detect these invasive cells. Jermyn *et al.* (1) have developed a hand held contact Raman Spectroscopy probe technique which can differentiate normal and invasive cancer cells in the brain. The commentary is very timely and once this technique is widely applied, a number of patients can survive free of brain cancer. What strikes the most about this technology is its high sensitivity (93%) and specificity (91%). The specificity and sensitivity of the sample labels provided by the surgeons after visual inspection was 73% and 86%, respectively. Surgeons were not given any information about the acquired Raman spectra during the resection procedure. Similarly pathologists were not informed about the spectra history when they did histopathological exams. To avoid any ambient light sources, the background reference measurement was subtracted from the respective spectrum and then normalized. During *in vivo* imaging although neuronavigation technologies were used but they were used for qualitative purposes only. Thus, the discrepancies associated with neuronavigation system were minimized. Overall, the research design was very appropriate to evaluate the potential of Raman spectroscopy to distinguish brain cancer from normal brain in grade 2 to 4 gliomas.

Successful treatment of cancer depends on appropriate therapy and also on improving methods and technologies to determine the disease risk and its early detection so that it can be treated more effectively. Although imaging technologies exist, but they are expensive, especially while using for screening an asymptomatic population. The technology proposed here has wide applications and is less expensive.

No exogenous compound is used in Raman spectroscopy to obtain optical contrast. Future potential improvements in this technology are very well described in the article indicating that Raman spectroscopy will set up the stage for clinical trials to test its efficacy in early glioma detection with standard-of-care technology.

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Footnote

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