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Label-free liquid biopsy based on blood circulating DNA detection using SERS-based nanotechnology for nasopharyngeal cancer screening

Abstract: Development of a sensitive, rapid and easy-to-use liquid biopsy method is of imperative clinical value for point-of-care cancer diagnostics. In this work, a label-free and modification-free nanotechnology based on surface-enhanced Raman spectroscopy (SERS) was developed for DNA analysis. Using the SERS signals of phosphate backbone as internal standard, quantitative detection for nucleobases was achieved at single base level. Combined with principal component analysis (PCA) and linear discriminant analysis (LDA), the method was applied for real blood circulating DNA detection, and a diagnostic sensitivity of 83.3% and specificity of 82.5% was achieved for differentiating the nasopharyngeal cancer from the normal group. This proof of concept experiment demonstrated promising potential for this method to become a rapid, easy-to-use, cost-effective and sensitive method for nasopharyngeal cancer detection based on liquid biopsy.

Keywords: DNA, SERS, nasopharyngeal cancer, liquid biopsy, nanotechnology, Raman spectroscopy

Biography: Haishan Zeng is a distinguished scientist with the BC Cancer Research Institute and a professor at the University of British Columbia. Dr. Zeng's research focuses on biophotonics and its medical applications. His group has pioneered the multiphoton-absorption based laser therapy and is at leading position in endoscopy imaging and Raman spectroscopy for noninvasive early cancer detection. He has published over 200 refereed papers and holds 30 granted patents. Several medical devices derived from these patents including fluorescence endoscopy (ONCO-LIFE™) and rapid Raman spectroscopy (Aura™) have passed regulatory approvals. The Aura™ device was awarded the Prism Award in 2013 by the International Society for Optics and Photonics.