Multiplex SERS-Lectin-Immunoassay for Oesophageal Adenocarcinoma Screening

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Oesophageal Adenocarcinoma (OAC) is often diagnosed at a late stage, contributing to the low 5-year survival rate of 22%. Detection of serum biomarkers using liquid biopsy could overcome limitations presented by endoscopy and invasive tissue biopsy to early diagnose OAC and its pre-malignant condition Barrett's oesophagus (BO). In previous studies, aberrant alterations in the glycosylation process forms aberrant glycoproteins causing the proliferation of OAC and BO. Recently, a new discovery by Shah et.al[1] validated novel serum glycosylated proteins including specific glycoforms of complement 9 (C9), gelsolin (GSN), and prekallikrein (KLKB1). Thus, analysing these three glycoproteins in a minimal invasive liquid biopsy-based test can possibly differentiate between OAC and BO. My study developed an innovative and minimally invasive liquid biopsy-based test via a novel multiplex Surface enhanced Raman spectroscopy-lectin immunoassay (SERS-LIA) for sensitive and specific glycoprotein detection. I found the limit of detection for C9, GSN, and KLKB1 glycoproteins at 30 ng mL^{-1}, 53 ng mL^{-1}, and 23 ng mL^{-1} in an unprocessed serum, respectively. SERS-LIA also successfully differentiated OAC, BO, and healthy sera consisting of 15 healthy controls, 16 BO patients, and 11 OAC patients. The Multilinear regression analysis (MLR) of our SERS-LIA achieved excellent receiver operating characteristic (ROC) curves with area under the curve of 1.00 for OAC versus healthy, 0.98 for BO versus healthy, and 1.00 for OAC versus BO. Overall, the SERS-LIA showed high sensitivity and specificity for detecting C9, GSN, and KLKB1 in an unprocessed serum. I believe SERS-LIA has a high potential for translation into the clinical settings for early diagnosis of OAC.

Reference

[1] Shah, A. K., et al. *Mol Cell Proteomics* **2018**, *17* (12), 2324-2334.