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Title: Electronic nose detects early stage and peripheral lung cancers

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Body: We have reported that exhaled volatile organic compound (eVOC) profile of lung cancer (LC) subjects differed from healthy ever smokers (HS). Aim: To determine if eVOC profile of LC subgroups (1) peripheral tumours and (2) early stage disease differ from HS. Method: LC (n=53) and HS (n=177) subjects provided a breath sample after tidal breathing through an inspiratory port filter for 5 mins. It was analysed with a 32 sensor Cyranose 320 (Smiths Detection). Tumours were staged (7th ed TNM system), and defined as peripheral if located in the outer 1/3 of lung fields on axial CT images. LC subgroups were: Stages I/II (n=27), III/IV (n=25), central (n=32) and peripheral tumors (n=21). Data were reduced to principal components for canonical discriminant analysis to determine differences between groups. Accuracy was calculated using SPSS V17.0 with leave one out cross validation. Results: The eVOC profile distinguished between LC and HS with a cross validation (CVV) accuracy of 79%, ($p<0.0001$). Analysis of HS, early (I/II) and late (III/IV) stage LC showed an eVOC profile CVV accuracy of 77%. A principal component vector was significantly different between early (I/II) stage LC and HS ($p<0.0001$). eVOC profile CVV accuracy was 77% when analysing central, peripheral and HS cases. A principal component vector was significantly different between peripheral LC and HS ($p=0.03$). Conclusion: These data indicate the ability of exhaled breath VOC profiles to distinguish early stage and peripheral lung cancer cases from healthy ever smokers, and therefore support its potential as a non-invasive screening tool for early detection of lung cancer.
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