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ATTENUATED TOTAL REFLECTION-FOURIER TRANSFORM INFRARED (ATR-FTIR) SPECTROSCOPY ANALYSIS OF SALIVA FOR BREAST CANCER DIAGNOSIS

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This study aims to investigate differences in the spectra between the analyzed groups of patients, as well as the specific influence of the relevant clinical characteristics of breast cancer patients. Moreover, the possible vibrational modes and molecules that contribute to the spectral differences are described. Saliva samples were collected before surgery from 10 patients with confirmed breast cancer by clinical, histological, and pathological examination; 10 patients with benign breast disease; and 10 without pathological findings, the control group. Saliva samples were processed and lyophilized overnight. The spectra were measured in a FTIR spectrometer VERTEX 70/70v coupled with platinum diamond ATR. ATR-FTIR spectroscopy was capable to discriminate breast cancer saliva from benign breast disease and control. Higher absorbance levels were found in breast cancer patients at wavenumber 1041 cm^{-1} , with reasonable accuracy, and in the area of $1433\text{--}1302.9\text{ cm}^{-1}$ region, with good accuracy. These increases in absorbance levels between breast cancer and the other two groups of patients were associated to changes in vibrational modes of nucleic acids, protein, lipids, and carbohydrates. Changes in absorptions bands within breast cancer group were found to be dependent of the tumor phenotype and related mainly to protein and nucleic acid. Therefore, the FTIR spectroscopy was capable to show biochemical changes in saliva components as result of breast carcinogenesis that cause different vibrational modes in the biomolecules. This study is the first to generate FTIR spectra from saliva and derive chemical fingerprints for the purpose of diagnosis and prognosis of breast cancer. It is important to note that differently from other methods that search biomarkers in saliva, FTIR detect changes at a multi-molecular level, being a promising tool for early diagnosis and prognosis of breast cancer.