EXPRESS DIAGNOSTICS PERIODONTITIS BY CHANGING THE SPECTRAL CHARACTERISTICS OF TEETH ENAMEL

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Materials:
42 teeth (molars and premolars) of patients diagnosed with periodontitis were used as the subjects of the study. The age group of patients of both genders was 35-70. All the studied categories of teeth were divided in two main groups: 1st group – control (teeth removed for orthodontical reasons – healthy teeth), 2nd group – the teeth diagnosed with periodontitis.

Method:
The studies were carried out using the Raman spectroscopy method. The experimental stand included a semiconductor laser (LML-785.0RB-04), an optical module for Raman spectroscopy (PBL 785), a spectrograph (Sharmrock SR-303i) with integrated digital camera (ANDOR DV-420A-OE) that was cooled to -60 °C and a computer.

Aim of the work:
The aim of the study is developing noninvasive rapid assessment of periodontitis on the base of change of the enamel spectral characteristics.

RESULTS

![Modeling the spectral the contour of the Raman spectra for enamel tissue](image1)

Mean = -1,25
SD = 1,052
N = 67

Mean = 1,95
SD = 0,912
N = 43

Figure 1 - Modeling the spectral the contour of the Raman spectra for enamel tissue

Figure 3. Chart of the linear discriminant function values of the enamel samples. The red line is the enamel of teeth with periodontitis (damaged enamel), and the blue line is the enamel of healthy teeth.

Figure 2 - The averaged Raman spectra, normalized to the average intensity of 2 studied groups of teeth: healthy enamel (Ia) and enamel with periodontitis (Iia)

![The values of factor structure coefficients of the enamel samples](image2)

![ROC-analysis of the algorithm for periodontitis assessment using the Raman spectroscopy method](image3)

![The «balance point» between sensitivity and specificity](image4)

Conclusions:
The main spectral changes in tooth enamel that occur in case of periodontitis. The structural changes of enamel of the teeth with periodontitis that occur in water-mineral metabolism disorder in the tissues of teeth (intensive substitution of hydroxide ion OH by carbonate apatite ions in the structure) and in collagen synthesis disorder have been identified.

Diagnosing the spectral changes in tooth enamel will allow identifying patients from the group of risk of having periodontitis. The developed algorithm sensitivity and specificity were 95.5% and 95.3%.