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Express Assessment of Sonoelastographic Parameters in Patients with Tumors of the Parotid Salivary Gland

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Abstract[1]— The aim of the work was to develop effective integral characteristics of the express assessment of the elasticity index and elastotype in patients with tumors of the parotid salivary gland, that made it possible to obtain a certificate of official registration of the program for electronic computers..

Keywords— sonoelastography, tumor, parotid, salivary gland, elastotype.

I. Introduction

Elastography in the diagnosis of parotid salivary gland tumors is used as an effective and modern tool to increase the diagnostic value of ultrasonography [1,2]. The issue of developing diagnostic methods that determine the nature of tumor tissue in the parotid salivary gland remains relevant. The conducted studies with the study of symptoms, characteristics of the development of tumor diseases, made it possible to use electronic computing programs in order to study the algorithmization of the development of clinical manifestations, as well as types of tumors. And here the least squares method is widely used, which is the basic method of regression analysis. The least squares method has been comprehensively studied and has several theoretical justifications [3].

II. Patients and Methods

Clinical material was used with data from 126 patients with tumors of the parotid salivary gland. To enter the initial information into the computer and its subsequent statistical processing, an encoding card of the examination of patients was used, which included 68 clinical and diagnostic indicators.

All the studied patients were divided into 2 groups:

1) the main group (99 patients with benign tumors of the parotid gland);

2) comparative group (27 patients with malignant tumors of the parotid gland).

Sonoelastography was performed by compression method on the LOGIQ S8 (GE XD Clear) device, using a linear sensor.

Statistical processing of the obtained data made it possible to determine the most informative indicators, on the basis of which linear integral characteristics of the elasticity index and elastotype of the parotid tumors were constructed.

The mathematical model was constructed using the least squares method in the form of:

$$\Psi(x) = \sum_{i=1}^{n} a_i x_i + a_0 \qquad (1)$$

$\Psi(x)$ – the degree of elasticity of tumor tissue;

a_i – weighting coefficients of features;

x_i – clinical and instrumental indicators;

a_0 – a free element.

The mathematical model was constructed taking into account the following minimization criterion:

$$E\left[\Psi(x) - S\right]^2 \rightarrow \min \qquad (2)$$

E - mathematical expectation operator;

$S-$ degree of elasticity and/or elastotype.

Regression analysis using the least squares method was used to identify patterns and build mathematical models. The parameters of the model were effective not lower than the level of $p<0.05$ according to the t-criterion. Calculations were performed on an IBM Pentium-type personal computer using the statistical software STATISTICA-10.

III. RESULTS

During the calculations, the following models were obtained:

Elasticity index:

Elasto (val) = 5,7616 - 0,0704*X2 + 0,3647*X3 - 0,3284*Y2 + 0,0771*X7

Classification of elastotypes:

Elasto (klass) = 7,2662 + 1,002*Z2 - 0,3192*Y2 - 1,2533*Z5

TABLE I.

X2	Duration of the disease	Years
X3	Number of previous operations	Quantity
Z2	Histological answer before surgery	1-cancer 2-pleomorphic adenoma 3-adenolymphoma
Y2	Ultrasound structure of the tumor	3-inflammation 4-cavity component 5-cellular character 7-heterogeneous structure 8-homogeneous structure
X7	Ultrasound of lymph nodes	mm
Z5	Color Doppler mapping	1-hypervascularity 2-hypovascularity
		3-avascularity

The accuracy of the express assessment of the elasticity index and elastotype in patients with tumors of the parotid salivary gland was more than 95%. According to this on the basis of equations (1,2) it was the basis for the development and registration of the software tool "Express assessment of the elasticity index and elastotype in patients with tumors of the parotid salivary gland", (EOE-OOSJ.exe).

IV. REFERENCES

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