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Results

According to the criteria of the International diabetes Federation (IDF 2005), out of the 238 patients with endometrial cancer, there were 135 (56.7%) with metabolic syndrome. Stage I was observed in 127 (94%) patients, stage II in 4 (2.9%) patients and stage III in 4 patients (2.9%). All patients were diagnosed with endometrioid adenocarcinoma. When assessing the depth of invasion, it was found that the tumor within the mucosa was observed in 18 (14.1%) patients, invasion depth of less than ½ of the myometrium in 83(65.3%) patients, and invasion depth of more than ½ of the myometrium in 26 (20.4%) patients. High-grade tumor was found in 21 (16.5%) patients, intermediate grade tumor in 84 (66.1%) patients, and low-grade tumor was observed in 22 (17.3%) patients. In the assessment of reproductive function, it was noted that 108 (85%) patients were in menopause, and 19 (14.9%) patients were of reproductive age. The patients' mean age was 54.3 years. Regarding postoperative complications, there were: pelvic hematoma, subacute ischemic stroke in posterior cerebral artery on the left and thrombophlebitis of the GSV (popliteal segment) and tibial veins on the right. The frequency of 3- 4 - and 5-component MS was analyzed in 31 patients. It was revealed that the 3-component MS was found in 6 (19.3%) patients, 4-component MS in 16 (51%) patients and 5 component MS in 8 (25.8%) patients. The 4-component MS was the most common. The most common 4-component MS combinations were as follows: abdominal obesity, elevated blood pressure, reduced HDL cholesterol and elevated glucose level (31.2%) followed by abdominal obesity, elevated blood pressure, reduced HDL cholesterol and elevated triglycerides (31.2%). The most common 3-component MS combinations were: abdominal obesity, elevated blood pressure level with a violation of carbohydrate and lipid metabolism (50%)

Conclusions

The proportion of endometrial cancer with metabolic syndrome were the depth of invasion of less than ½ of the myometrium (65.3%) and intermediate grade tumor (66.1%). The 4-component MS was the most common combination of MS.

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PARAFFIN EMBEDDED CANCER TISSUE 2D TERAHERTZ IMAGING AND MACHINE LEARNING ANALYSIS

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Absorption spectra of paraffin-embedded prostate and adenocarcinoma cancer tissues and healthy tissues have been measured in the 0.3-3 THz range. The Principal Component Analysis was applied to separate informative features in measured THz spectra. The Support Vector Machine (SVM) classifier was created which allows to distinguish the tumor tissues from healthy tissues, including classification of prostate cancer tissue stage according to the Gleason scale.

Keywords: THz spectroscopy, paraffin-embedded samples, adenocarcinoma-affected tissues, principal component analysis, support vector machine.

Introduction

Formalin-fixed paraffin-embedded (FFPE) tissue samples are widely used worldwide in diagnosis and research. The protocol for FFPE tissue samples sectioning has been developed to prevent cross-contamination and distributed between participating centers [1]. An international panel of pathologists developed a consensus histopathology evaluation form, as a result, the histopathology evaluation of the cases assured the presence of the targeted tissue, identified the presence of other tissues that could disturb the molecular diagnosis and allowed the assessment of tissue quality. Thus, the protocol allows processing correctly FFPE tissue samples for study.

The cancer diagnostics is known to be one of the main problems in medicine. A challenge in the cancer diagnosis and surgery is operative tumor localization. The investigation of paraffin tissue blocks could provide useful information to determine the position and extent of the embedded tissue prior to the histopathology sectioning [2].

Difference in THz absorbance between malignant tumor and normal tissues can be useful for instrumental diagnosis. Recently, the THz imaging has been used to identify skin tumors [3], breast cancer [4], colon cancer [5], malignant tumor in liver [6], in brain [7]. To realize potential of THz imaging, efficient methods of automatic image content analysis should be created.

The results of application of Machine Learning approach in paraffin embedded cancer tissue terahertz 2d imaging analysis will be discussed in the report.

Results

Absorption spectra of paraffin blocks were measured using of Time-domain THz spectrometer (EKSPLA, Estonia) with tuning range 0.3-3 THz. A spatial 2D absorption spectra scanning with averaging over scans at every spatial point (1024 scans) was carried out. The spatial step of scanning was varied from 0.1 mm to 1.0 mm. The examples of THz images are presented in the Figure 1. In total, 100 scans for cancer and healthy tissues were analyzed.

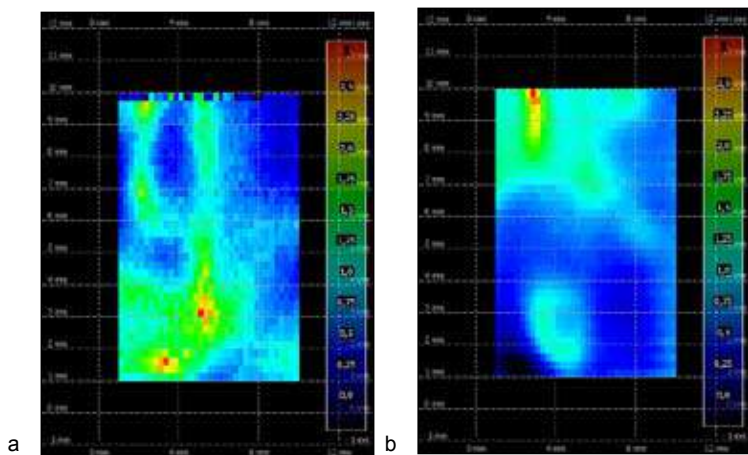


Figure 1. 2D image of prostate cancer metastasis in lymph node (a) and healthy node (b), 0.4 THz

The results of SVM classification of lymph node metastasis and healthy node THz images are presented in the Table 1.

Table 1

SVM classification of lymph node metastasis and healthy node THz images

Binary classification	Sensitivity		Specificity	
	Mean	Standard deviation	Mean	Standard deviation
Cancer tissue / Healthy tissue	0.987	0.0002	0.983	0.0002

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CELLULAR MOTILITY PROTEINS AS NEW MOLECULAR MARKERS FOR EARLY DIAGNOSIS OF CANCER

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In the process of neoplastic transformation epithelial cells acquire the property of motility. In the present work, the contents of actin-binding proteins and calpain activity in malignant tumors and precancer tissues were studied for estimation of the involvement of locomotor proteins in the process of carcinogenesis. The contents of actin-binding proteins were evaluated by flow cytometry, Western blotting and by the ELISA. In patients with dysplastic changes in the epithelium of the larynx, the content of CAP1 was decreased compared to the group of patients with laryngeal cancer, stage I. An increase in arp3, gelsolin, cofilin-1, thymosin- β 4 in endometrial cancer was shown in comparison to hyperplasia. Single-factor logistic regression analysis showed that the activity of calpains in hyperplastic tissue and the levels of thymosin- β 4 and cofilin can be an independent predictor of the development of cancer.

Keywords: cancer, precancer, cellular motility, actin-binding proteins, calpains.

Introduction

Neoplastic transformation and following cancer progression are associated with the basic cancer properties as disorders of the cell locomotion. The acquirement of the malignant phenotype leads to changes in cell cytoskeleton, that are important for epithelial cancer cell proliferation, migration and epithelial-mesenchymal transition [1, 2]. The remodeling of actin cytoskeleton plays a central role in generating force to drive cell locomotion, which is regulated by a plethora of actin binding proteins (ABPs). These ABPs perform the different functions: bind actin monomers (thymosin β -4); depolymerize and sever filaments (cofilin-1, gelsolin) and facilitate the formation of filament bundles (Arp2/3) [3]. Recently, a new ABP - cyclase-associated protein (CAP 1) has been discovered, which cuts actin filaments [4]. Cancer cell movement is linked to calcium-dependent intracellular nonlysosomal cysteine proteases calpains which affect cancer cell motility through many pathways, such as the Wnt- and the NF- κ B- signaling pathways [8, 9]. ABPs and calpains play an important role in pathogenesis of cancer [5, 6, 7, 10]. **The aim of the study** was to compare the content of ABPs and calpain activity in cancerous and precancerous tissues.

Material and Methods

The material for the study was the samples of cancerous and precancerous tissues. The study included 32 primary patients with histologically verified cancer of the larynx and laryngopharynx (T1-4N0-3M0), 12 patients with chronic inflammatory laryngeal and laryngopharyngeal diseases associated with dysplastic changes in the mucous membrane (DI-III). Also the study included 31 postmenopausal patients with stage I-II endometrioid EC and 40 patients with typical and atypical endometrial hyperplasia.

Tissue homogenates of cancerous and precancerous tissues of the larynx and laryngopharynx were analyzed using the Human Adenylyl cyclase-associated protein ELISA Kit (Cusabio) on an Anthos Reader 2020 (Biochrom) microplate reader. The content of Arp3, gelsolin, cofilin and thymosin β -4 levels was determined by Flow cytometry and Western blotting. The total calpain