# Method of monitoring condition of prostate cancer patients

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## Introduction

Prostate cancer is the most commonly diagnosed cancer in men. According to the US Centers for Disease Control and Prevention (CDC), after lung cancer, prostate cancer is the leading cause of cancer death among American men. The good news, however, is that the current survival rate is 97 percent. On average, an American man has a 30 percent risk of having prostate cancer in his lifetime, but only a 3 percent risk of dying of the disease. Perhaps the most encouraging prostate cancer statistic is that more men die with prostate cancer than from prostate cancer. The reason could be twofold: prostate cancer typically affects men older than 65 and, it is often a slowly progressing disease. Prostate cancer is a complex disease. Often it is difficult to predict how fast or slow it will grow. Predicting and monitoring the disease with accuracy help doctors and patients make decisions that result in the best survival rates and quality of life.

The most common approach in preventing the prostate cancer for many years was considered monitoring the level of prostate-specific antigen (PSA) and its velocity (rate of change of PSA level). The recent results of the European Randomized Trial of Prostate Cancer Screening[1] give qualified support for prostate cancer screening; there is also clear evidence supporting the use of PSA[2] and free PSA[3] to identify cancer, the exclusion of younger[4] and older men[5] from screening, and differential recommendations for African Americans and those with a family history of prostate cancer[6] .

At the same time In October 2011, the U.S. Preventive Services Task Force (USPSTF) posted for public comment the draft of its recommendation regarding prostate cancer screening. It was directed against the guidelines of the National Comprehensive Cancer Network (NCCN) which state that men with a high PSA velocity—greater than 0.35 ng $mL^{-1}y^{-1}$ —should consider biopsy even if absolute level of PSA is very low. Task Force concludes that many men are harmed as a result of such prostate cancer screening and few, if any, benefit. This conclusion was strongly supported by a special experimental testing[7]. A better test and better treatment options are needed. Until these are available, the USPSTF has recommended against screening for prostate cancer[8].

The aim of this work was testing a new approach to monitoring patients with prostate cancer.

**Research objectives**

Research is based on the selection from the cohort of prostate cancer (PC) patients recorded in a database of the Russian Scientific Center of Radiology and Surgery Technologies, containing the treatment results for more than 3,000 patients with prostate cancer, traced down to 15-25 years. It was planned to select the patients with alternative prognosis. "The positive edge of the prognosis" contained the patients with locally advanced and/or generalized prostate cancer who have been living for more than 7-10 years from the time of PC diagnosis. "The negative edge of the prognosis" contained patients with localized and/or locally advanced prostate cancer who died from progression of primary disease in two or three years from the time of making diagnosis. In order to form "edges of prognosis" (EP) it was planned to study several groups of patients using the results of their biopsies obtained before treatment. This allows determining the concentration of the markers which characterize the level of cell proliferation and cell loss, as well as some molecular-genetic characteristics of tumors by the results of morphological, immuno-histochemical and genetic methods. Our own experience suggests that the farther away from each other two "edges of prognosis" are, the more clearly visible the signs, which have the maximum impact on the outcomes of cancer treatment.

**Method**

GDV Technology is based on the well-known Kirlian effect: when an object is placed on a glass plate and stimulated with current, a visible glow occurs, the gas discharge. With gaseous discharge visualization (GDV) bioelectrography cameras, the Kirlian effect is quantifiable and reproducible for scientific research purposes. Images captured of all ten fingers on each human subject provide detailed information on the person's psycho-somatic and physiological state[9]. The GDV camera systems and their accompanying software are being used in medicine and psychology[10],[11],[12],[13],[14]. Through investigating the fluorescent fingertip images, which dynamically change with emotional and health states, one can identify areas of congestion or health in the whole system. The mild electrical stimulation initiated by the GDV creates a neurovascular reaction that registers on the skin. The characteristics of this reaction are influenced by the nervous-humoral status of all organs and systems. Images of these reactions are digitally captured and analyzed. In addition, for most healthy people GDV readings vary less than 10% over time, indicating a high level of precision in this technique[15]. GDV technology has been accepted by the Russian Ministry of Sport as one of several techniques used to rapidly evaluate an athletes' psycho-physiological state[16]. GDV Camera instrument commercially available from the KTI Company (www.ktispb.ru) was used in this study.

In 1999 research project on GDV measurements of oncology patients was initiated by specialists of the National Oncology Center of Georgia, Tbilisi and St. Petersburg University ITMO, Russia. More than 2000 patients with different types of cancer were measured with GDV technique during several years. Statistical analysis of a big volume of experimental data collected during several years demonstrated highly significant statistical difference between GDV parameters of cancer patients and healthy population both for breast and lung cancer patients.

After treatment GDV parameters demonstrate shift toward "healthy" values[17],[18]. Fig.1. presents example of statistical processing of the results 140 women with breast cancer compared with the GDV results of 54 women with different non-oncological situations measured in the same conditions served as a control[18].

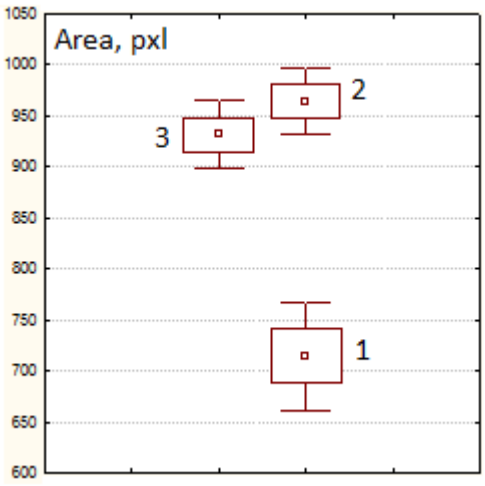


Fig.1. Statistical processing of the GDV data of 54 healthy women (1) and 140 women with breast cancer before (2) and after surgery (3)[18].

**Participants**

100 patients diagnosed with PC with conventional means including biopsy; and having conventional treatment have been selected for the study. All men, aged 63+/-15 years old. All participants voluntary agreed to take part in the research and were informed of the procedures and expected outcomes. Based on the results of the PSA analysis and clinical observations participants were distributed to three groups: "negative prognosis", "positive prognosis" and "intermediate prognosis". GDV measures were taken from 10 fingers of both hands before 2 - 6 weeks after complex treatment including surgery, chemotherapy and irradiation. Blind study design.

**Results**

Preliminary studies demonstrated that certain integral GDV characteristics of patients with prostate cancer correlated with the clinical course of malignant process (Fig. 2).

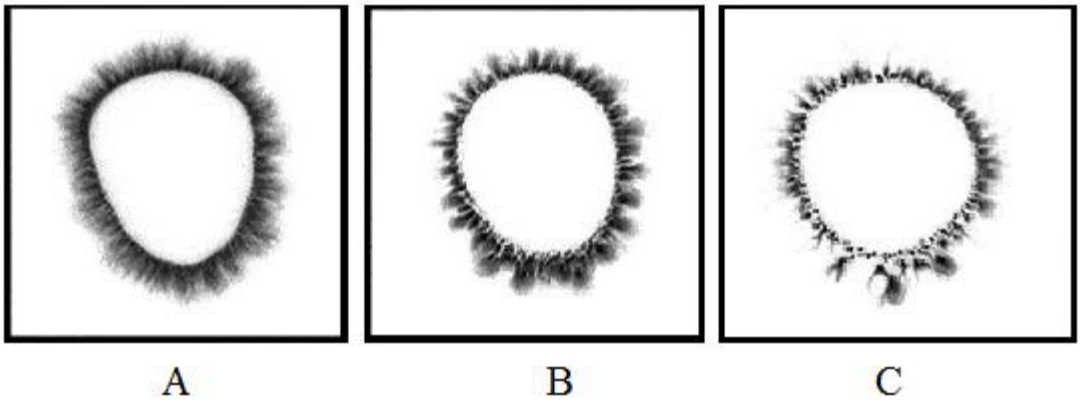


Fig.2. GDV images of fingers in case of a practically healthy person (A), patient with positive (B) and negative (C) prognosis of PC.

A comparison of the characteristics of GDV and the growth rate of prostate cancer also indicates the close relationship between these parameters. We have found statistically significant difference between GDV parameters of patients with positive and negative prognosis of PC (fig.3).

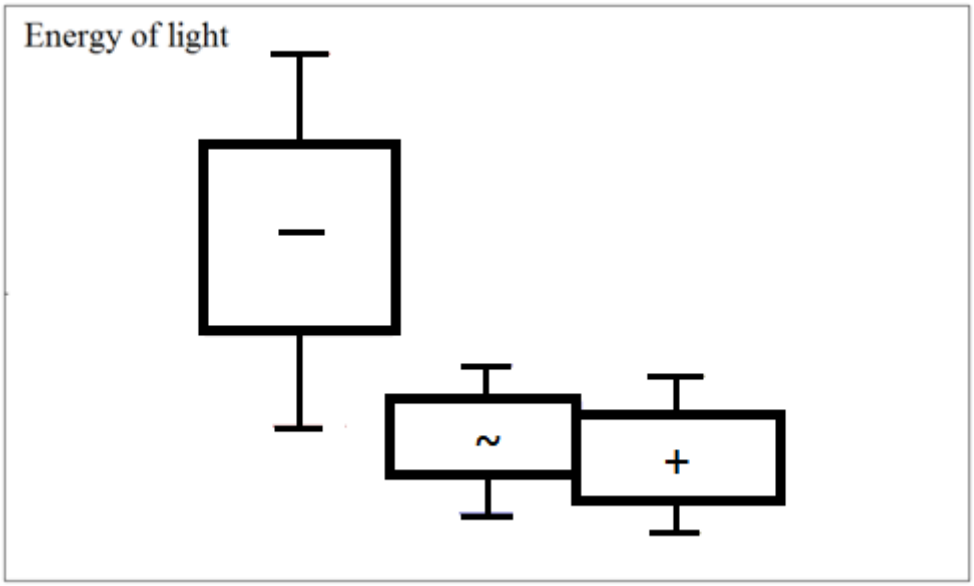


Fig.3. Statistical processing of the GDV data for patients with prostate cancer with negative prognosis (-), positive prognosis (+) and intermediate prognosis (~). About 30 people in every group.

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