# THE GDV TECHNIQUE APPLICATION IN ONCOLOGY

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Abstract

**Objectives**. To explore the potentials of the GDV Technologies as applicable to the oncology practice. The aim of the work was twofold: to find out the prognostic potential of the GDV and to see how it may reflect the monitoring of patient's state in the process of complex oncology treatment.

**Design**. All subjects were diagnosed with cancer with conventional means including biopsy; GDV measures were taken from 10 fingers of both hands before any oncology treatment and 2 and 6 weeks after complex treatment including surgery, chemotherapy and irradiation. Blind study design.

**Settings/Location.** Data collection: National Oncology Center of Georgia, Tbilisi; data processing: St. Petersburg Technical University ITMO, Russia; duration: 1999-2003.

**Subjects.** For the statistical analysis the following subjects diagnosed with III stage of cancer were selected: 109 subjects of both genders with lung cancer and 140 women with breast cancer; control group: 44 practically healthy people and 54 women with different non-oncological conditions.

**Interventions**. Surgery, chemotherapy, irradiation.

**Results**. Statistically significant difference between GDV parameters of oncology patients and non-oncology groups was found for all studied cases. After treatment statistical trend of GDV parameters towards healthy population parameters was revealed.

**Conclusions**. GDV Technique presents objective measures for evaluation of cancer state and monitoring of the patient's condition after treatment. Method is easy for application, non-invasive, objective and cheap. From several years of experience a good potential for the development of method of early evaluation of the probability of potential cancer is clearly seen. This approach should be based on computer data-mining multiparametric comparison with Database of nosological cases.

## Introduction

A lot of claim about diagnostic potential of Kirlian photography in cancer study has been made[1],[2],[3]. The most elaborate study was done by American researcher, L.W. Konikiewicz[4] (1979), who under careful laboratory conditions using double-blind studies, correctly identified cystic fibrosis patients. He also found that the day of the menstrual cycle influenced variations in the brightness of the energy field and that the day of ovulation could be detected. The patterns were different for subjects taking an oral contraceptive. Later[5] (1984) results were reported by the same group about success in detecting cancer and other abnormal physiological conditions. This approach was reproduced on a big population of women with cervix of the uterus cancer with demonstration of statistical significance of data[6]. Pilot study on detecting difference between GDV parameters of blood samples of healthy and cancer patients demonstrated reliable difference[7].

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 Technical University ITMO, Russia. This work was supported by then director of the Center prof. RJ. Vepchvadze (who died from cancer in 2001) with participation of leading physicians and specialists under the leadership of prof. EG. Gedevanishvili. First results were presented in 2000[8] and then in 2001[9]. More than 2000 patients with different types of cancer were measured with GDV technique during several years. In this paper we present data on lung and breast cancer.

**Techniques and methods**

GDV bioelectrography parameters from 10 fingers of both hands were measured with computerized complex "GDV-camera" instrument produced by the "Kirlionics Technologies International", Saint-Petersburg, Russia, having the following parameters: single impulse duration 10 mcs; repetition frequency 1000 Hz; induction interval 1 s; electrode voltage 12 kV. Image resolution was 160x120 pixel, all GDV-grams were measured with filter that was found to be independent from the psychological state of a subject [14].

At the same time in several clinical trials with a lot of subjects studied it was demonstrated that lung-bronchial and breast situations reflect to the peculiarities of the GDV image of the lower sector of the little fingers (5R and 5L) and endocrine situations reflect to the lower sector of the 4$^{th}$ fingers[10],[11],[12]. These findings correlate with Finger Diagnostic Tables by P. Mandel[13] and K. Korotkov[14] created in accordance with ideas of Traditional Chinese Medicine. So computer image processing with specially designed software package consisted of several steps:

1. Noise filtration in accordance with the principles given in [14];
2. Calculation of the "center of gravity" of finger's GDV-gram (see fig.1A);
3. Cutting off the lower 60$^{o}$ sector of the GDV-gram (fig.1B).
4. Calculation of the basic parameters for this sector: area, form coefficient, entropy, brightness and fractality in accordance with the principles given in[15],[16].
5. Statistical processing of parameters using standard software package "STATISTICS 5.0".

This approach allowed for reviling the specific features related to the lung and mammary situations only without the possible influence of information from other systems and organs.

Parameters for the lower 60$^{o}$ sectors of the 1$^{st}$ fingers were calculated as well as it may have been related to information from the bronchial system[14],[16].



A.      B.
Fig.1. Main principle of GDV image processing in this research.
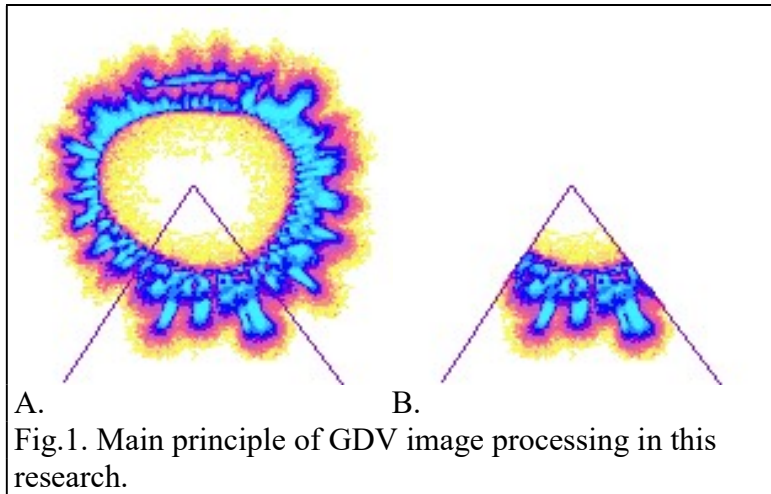
Data was collected during 1999-2002 in Tbilisi. Processing of data was done in 2003 in St. Petersburg. All GDV-grams were labeled with numbers without defining patients or healthy people. One person did computer image processing, another person did statistical calculations. So the experimental conditions may be interpreted as a blind test.

**Subjects**

109 patients of both genders with squamous cell carcinoma of lungs of the III stage and 140 women with the III stage of breast cancer were selected for the final analysis. Criteria for the selection were clinically proven cancer with tissue biopsy with prescibed subsequent treatment with surgery, chemotherapy and irradiation. Patients were measured with GDV before the treatment and 2 and 6 weeks after the end of treatment. All measurements were done in the morning 1 hour after the using restroom, on an empty stomach, in a calm situation, in one and the same clinical room, before any treatment or diagnostic procedures.

44 practically healthy people of both genders and 54 women with different non-oncological situations measured in the same conditions served as a control.

**Experimental Data**

Analysis of GDV parameters for the big group of people demonstrated that measures may be well described with Gaussian distribution (fig.2) that allowed using the parametric statistics, in particular t-test for the group data comparison.
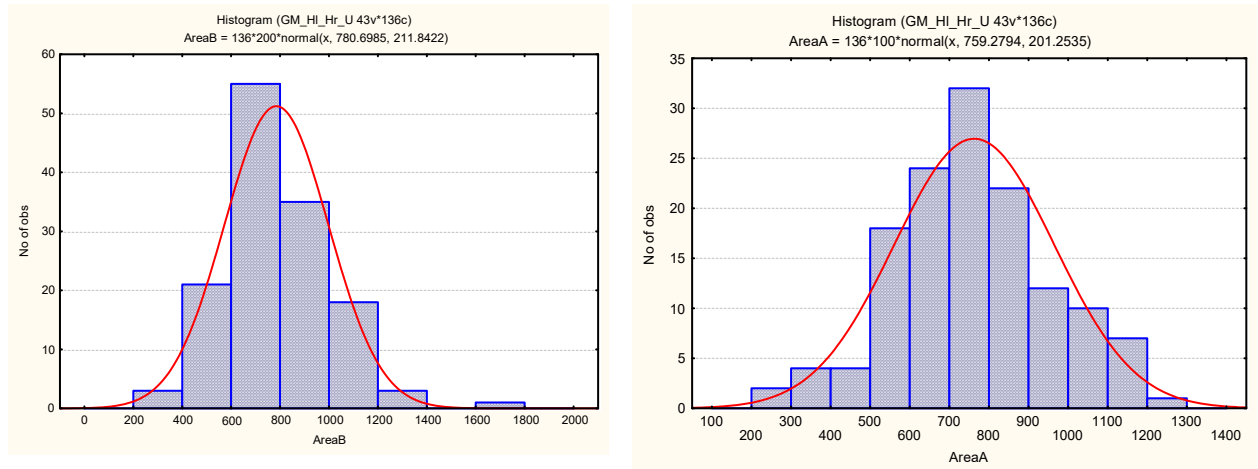


Fig.2. Histogram of the GDV Area before and after treatment for a group of BC patients.

Table 1 presents data on significant (p < 0.05) difference between GDV parameters for the cancer groups before treatment and healthy population.

**Table 1.** Significant difference between GDV parameters for the cancer groups (C) before treatment and healthy population (H). p < 0.01, (*) p < 0.05.

| Finger/cancer | Area | Entropy | Fractality | Form coeff | Brightness |
|---|---|---|---|---|---|
| 1L lungs | C < H | C < H (*) | C > H (*) | | |
| 1R lungs | C < H | | | | |
| 4L lungs | C > H (*) | | | C < H (*) | C < H |
| 4R lungs | | | | | |
| 5L lungs | C > H | C > H | C > H | C > H | |
| 5R lungs | C > H | C > H | C > H | C > H | |
| 1L breast | | | | | |
| 1R breast | C < H | | | | |
| 4L breast | | | | | |
| 4R breast | | | | | |
| 5L breast | C > H | | C > H | | |
| 5R breast | C > H | C > H | C > H | C > H | |

As we see from these data, the most consistent difference was found for the little fingers that correlate with idea of sector representation [14]. In all these cases the values of GDV parameters for little fingers was higher for cancer patients compared with healthy population. This may be considered as mark of energy system activation under the influence of disease. For other fingers the difference is not as consistent compared with little finger, although if we check the graphs we can find the difference practically in all cases, but not statistically significant. Graphs of experimental data are presented in Appendix.

Statistically significant difference between GDV parameters of breast cancer group and group of women with different non-oncological problems generate hope that it will be possible to find specific GDV correlates of the oncological condition at the early stage of cancer development.

After treatment the values of GDV parameters shift towards the values of healthy population, but in most cases the difference persists still (fig. 1-3). The method of cluster

analysis by 5L finger allows to distinguish groups of male and female, including division on the diseased male group, diseased female group and healthy group (fig.4).

**Conclusion**
1. Statistical analysis of a big volume of experimental data collected during long period of time demonstrated highly significant statistical difference between GDV parameters of cancer patients and healthy population both for breast and lung cancer patients.
2. After treatment GDV parameters demonstrate shift toward "healthy" values.
3. Little finger was found to be the most representative one for the particular nosologies that correlates with ideas of Chinese meridians presentation at the fingers.

**Further research**
Results of presented analysis together with data of other researches demonstrate at least two lines of practical applications for the developed methods:
1. Monitoring of cancer patients in the course of treatment and in the process of recovery. This line is totally developed and may be implemented into practical medical care based on existing GDV instruments and methods of data processing. If we take into consideration that in modern medicine there are practically no simple, non-invasive, non-expensive means of health monitoring, then we can accept GDV camera as unique system necessary for everyday health-care system.
2. Presented results give hope of developing the system of early cancer diagnosis based on GDV evaluation and system of active testing. This system should be based on multiparametric computer data-mining system based on machine learning approach successfully tested with GDV images[17]. It is very well known that cancer, spotted at the early stages of development, may be successfully treated with modern medical means. Simple non-invasive GDV analysis may serve as a first stage of regular check. Every person visiting the medical premises may be easily checked with this system. We can imagine this system even as a home appliance with analysis by specialists through the Internet.

Several lines of the further research should be developed:
1. Creating the Database of different cancer nosologies with higher resolution of images.
2. Developing of computerized machine learning system for early cancer diagnosis.
3. Developing of special software for monitoring the patients' state.
4. Internet exchange of the GDV data with on-line analysis.

This research has been developed by a mixed group of professionals including physicians, physicists, computer scientists and mathematicians. Combined efforts of a big group during several years allowed getting reliable statistically significant data. This was a pilot study without real funding based on enthusiasm and scientific interest of the researchers. This group of professionals is capable of creating a practical useful system of early cancer diagnosis and monitoring necessary for millions of people worldwide provided that their research efforts would be being supported.

**References**
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Gimbut V.S., Chernositov A.V. 2001. Some Characteristics Of Parameters Of The GDV Acupuncture Points Connected With The Uterus For The Pregnant With Different Lateral Behavioral Phenotype. In: Proceedings of the International Congress "Science, Information, Spirit", St. Petersburg, p. 5-6.

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Table of symbols:

| | |
|---|---|
| LC | - Lungs Cancer |
| BC or MG | - Breast (Mammary Gland) Cancer |
| Indication L | - Lungs Cancer |
| Indication M | - healthy males |
| Indication W | - healthy females |
| Indication LA | - LC after treatment |
| Indication LB | - LC before treatment |
| Indication MGA | - LC after treatment |
| Indication MGB | - LC before treatment |

Indications:
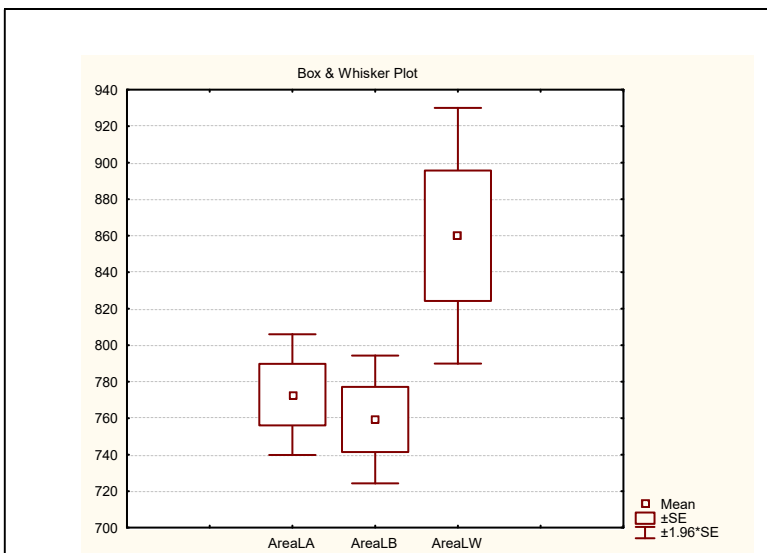Area – GDV Glow Area
AvBr – GDV Glow Average Brightness



Fig.1. GDV Area for BC group before (B) and after (A) treatment and Healthy group (W), 1R finger
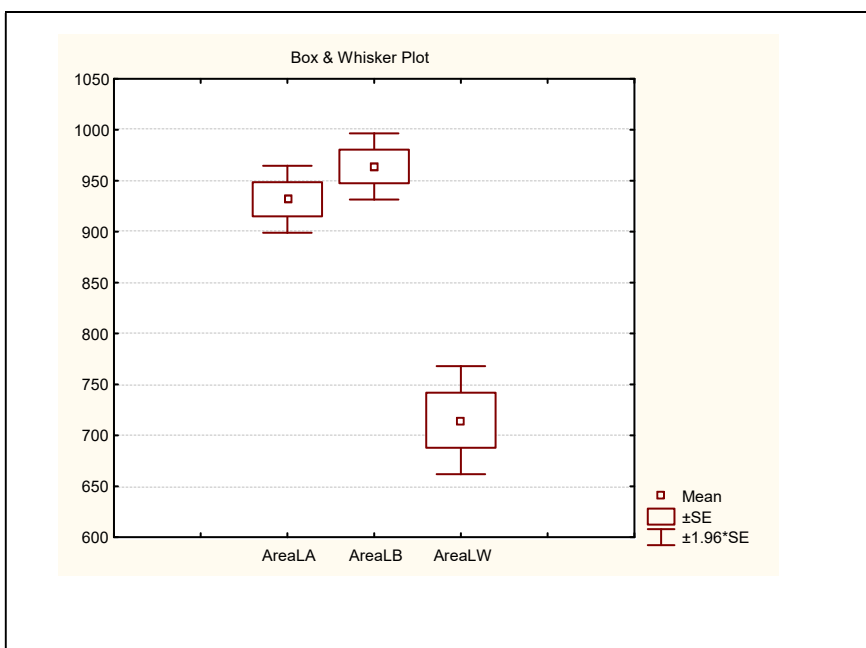


Fig. 2. GDV Area for BC group before (B) and after (A) treatment and Healthy group (W), 5L finger
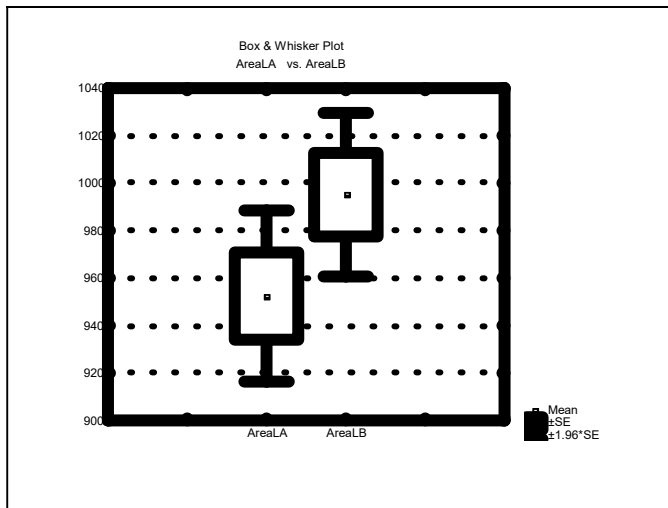
Fig. 3. GDV Area for BC group before (B) and after (A) treatment, 5R finger
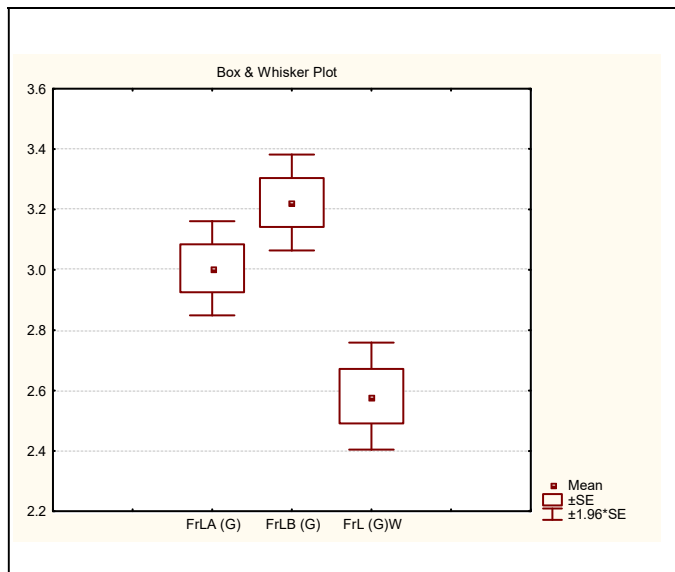


Fig. 4. GDV Fractal Coefficient for BC group before (B) and after (A) treatment and group of Healthy Women (W), 5R finger
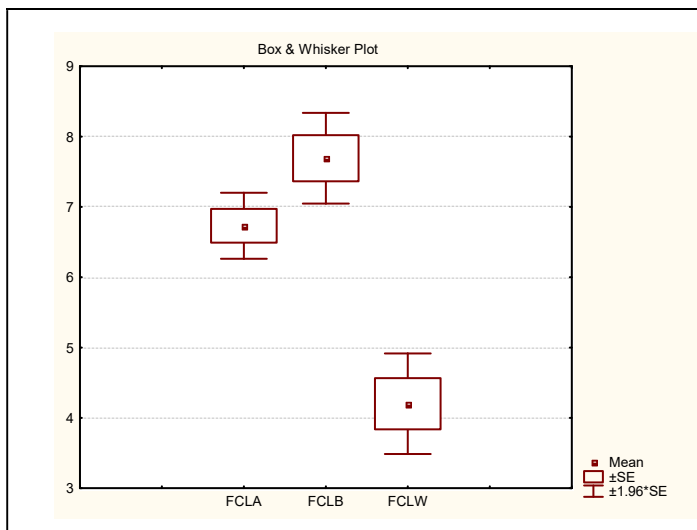


Fig. 5. GDV Form Coefficient for BC group before (B) and after (A) treatment and group of Healthy Women (W), 5L finger

**Comparison of different nosological groups**



Comparison of different nosological groups on GDV Form coefficient for the 5R finger
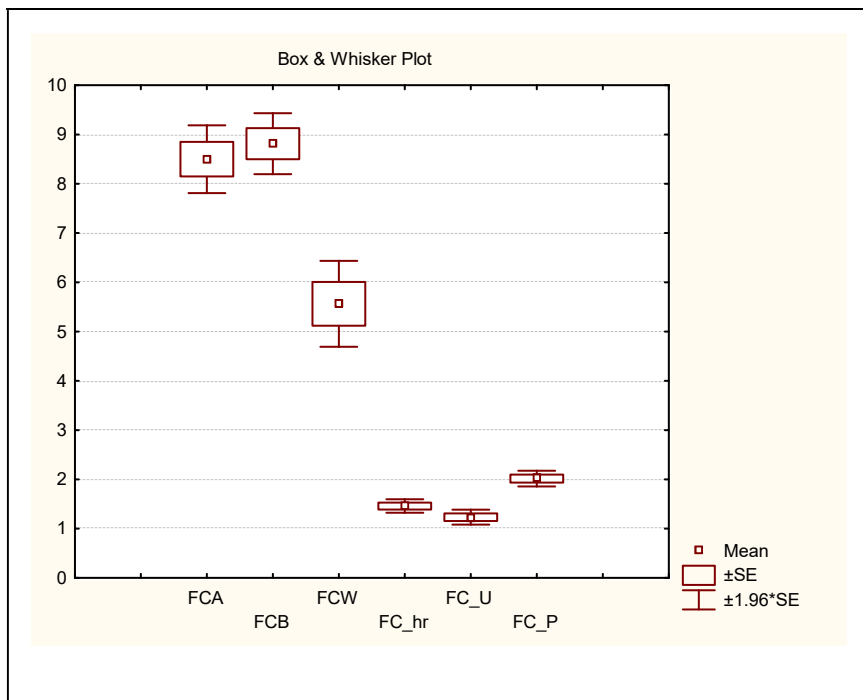

B – Breast Cancer group before treatment
A – Breast Cancer group after treatment
W – control group of practically healthy women
hr – group with heart problems
U – group with urological problems
P – happy group of pregnant women



Comparison of different nosological groups on GDV Form coefficient for the 5L finger
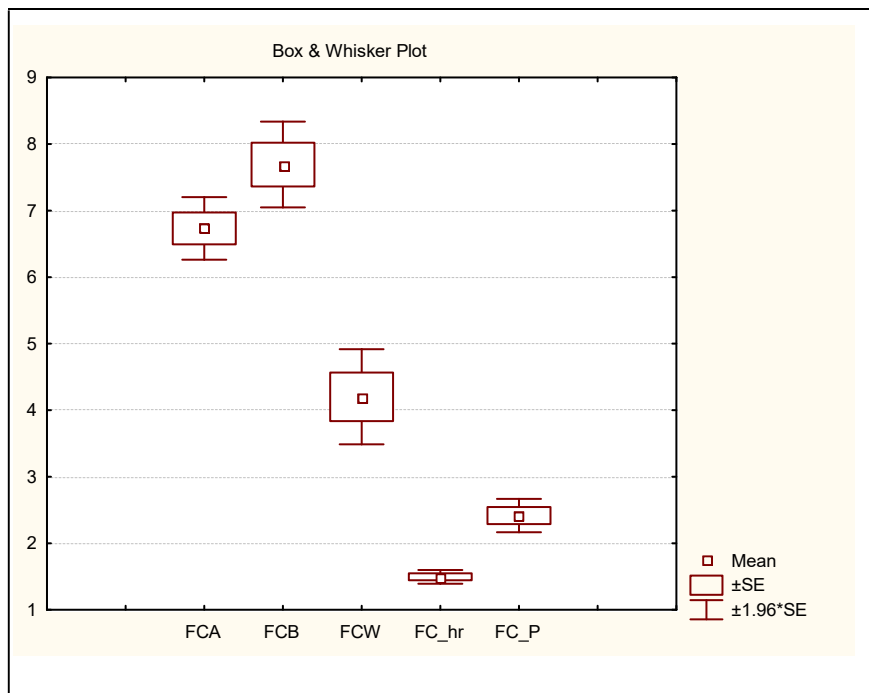
**Appendix 3.**
**Comparison of the GDV parameters for Lung Cancer group**
**after treatment (LA) and healthy population (H)**
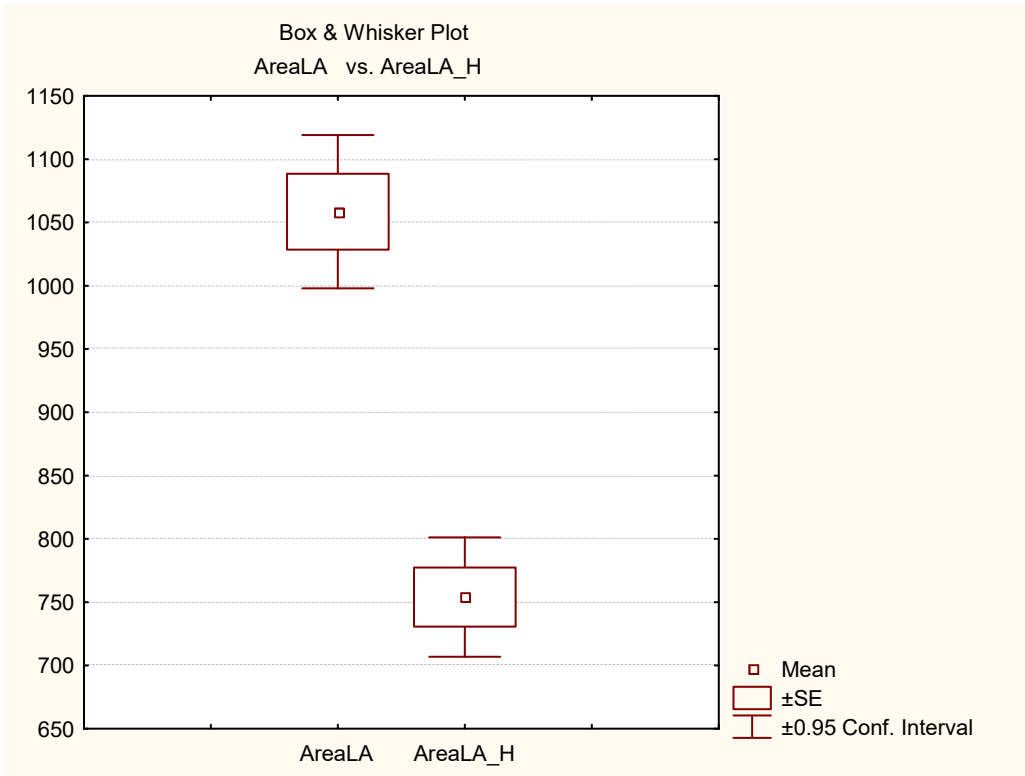
GDV Area 5L finger
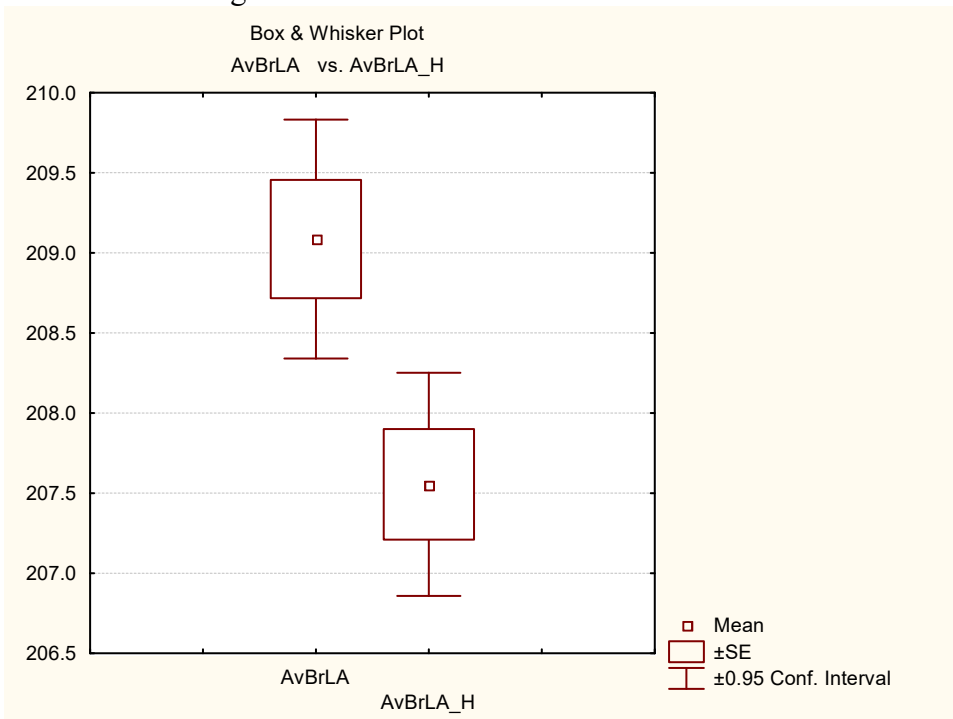


GDV Brightness
5L finger

Box & Whisker Plot
FCLA    vs. FCLA_H

□ Mean
▢ ±SE
⊤ ±0.95 Conf. Interval

GDV Fractal
Coefficient
5L finger



Box & Whisker Plot
EntLA (G) vs. EntLA (G)_H

□ Mean
▢ ±SE
⊤ ±0.95 Conf. Interval
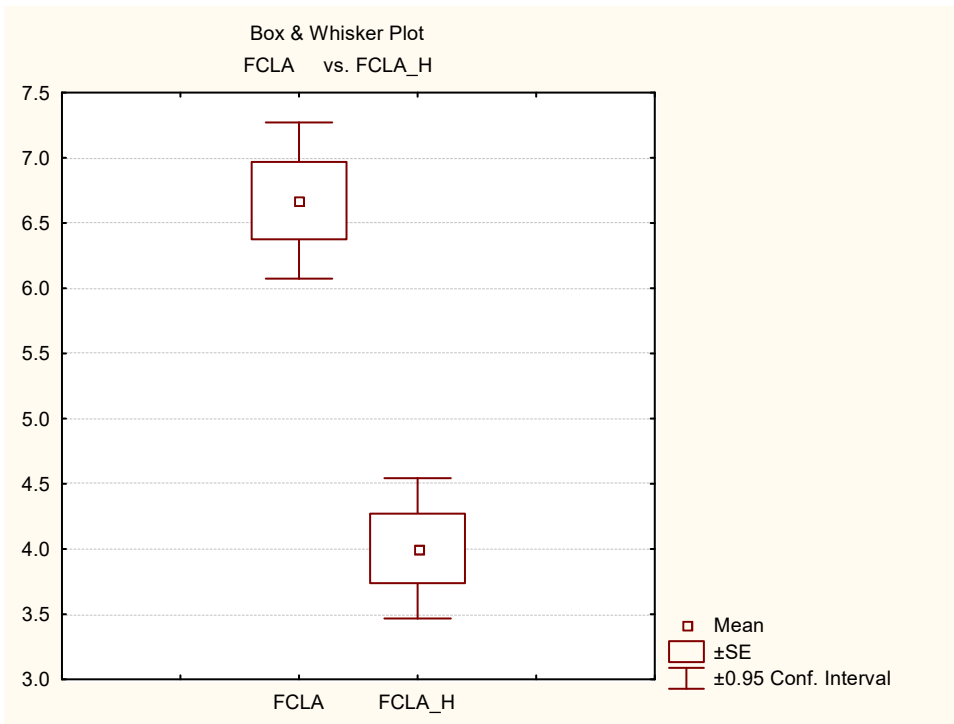
GDV Entropy
5L finger
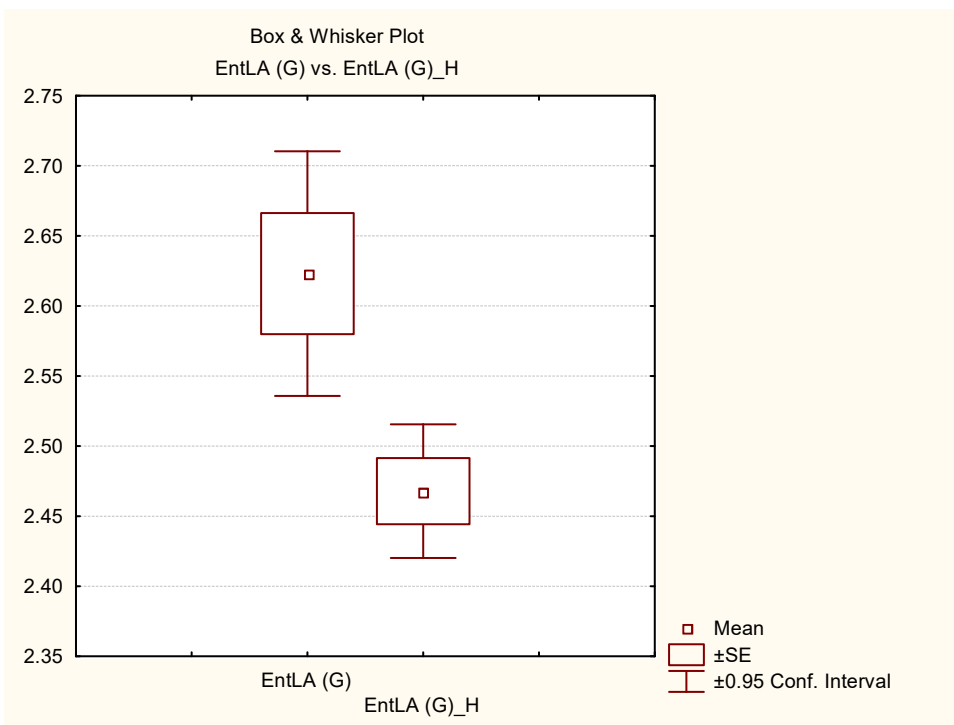
**Appendix 4.**
**Comparison of the GDV parameters for Lung Cancer group**
**before (LB) and after treatment (LA) and healthy population (H)**
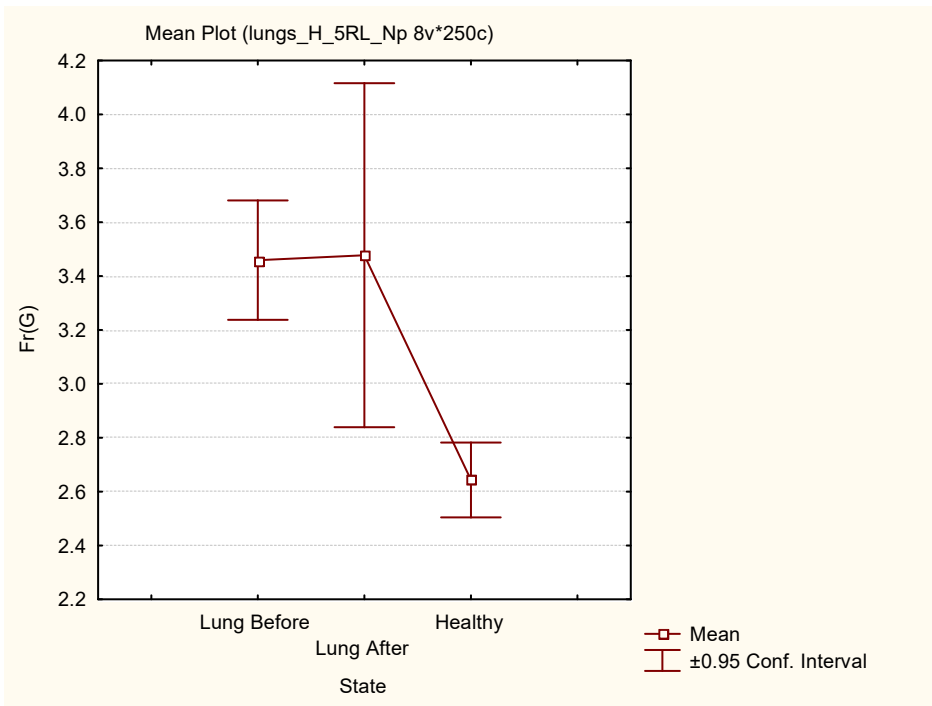


GDV Fractality
5R finger
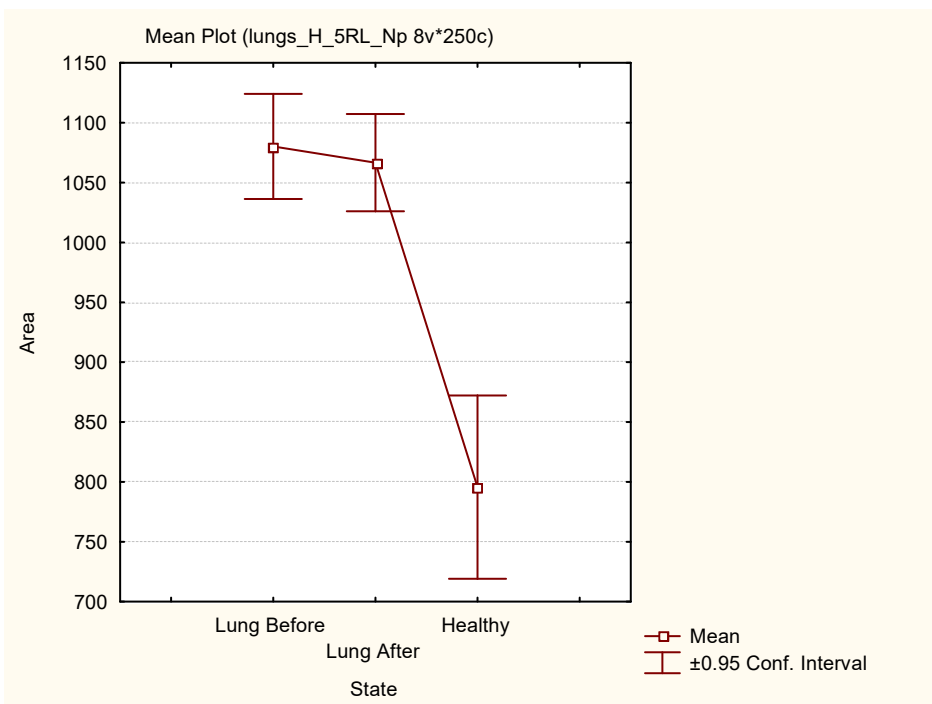


GDV Area
5R finger

GDV Form Coefficient
5R finger
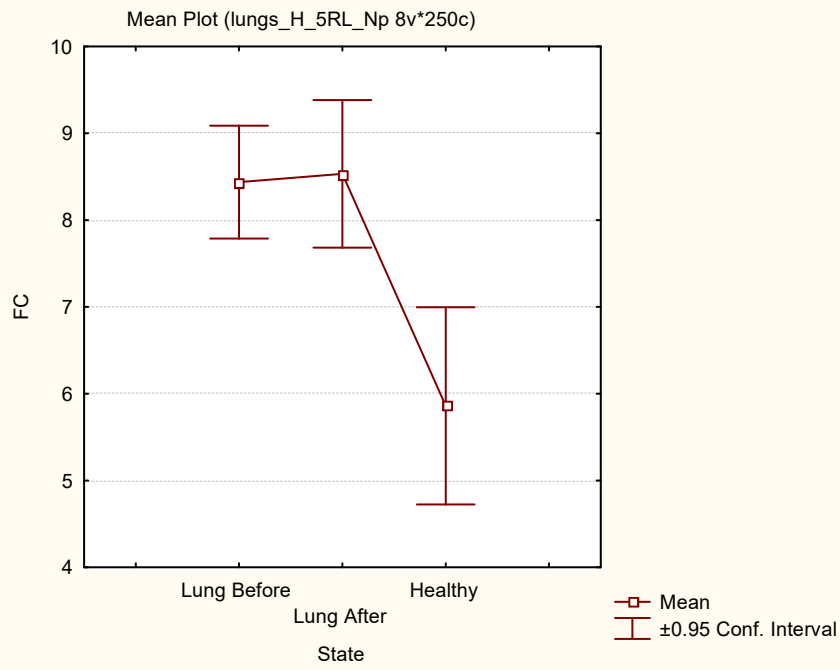


GDV Entropy
5 R finger
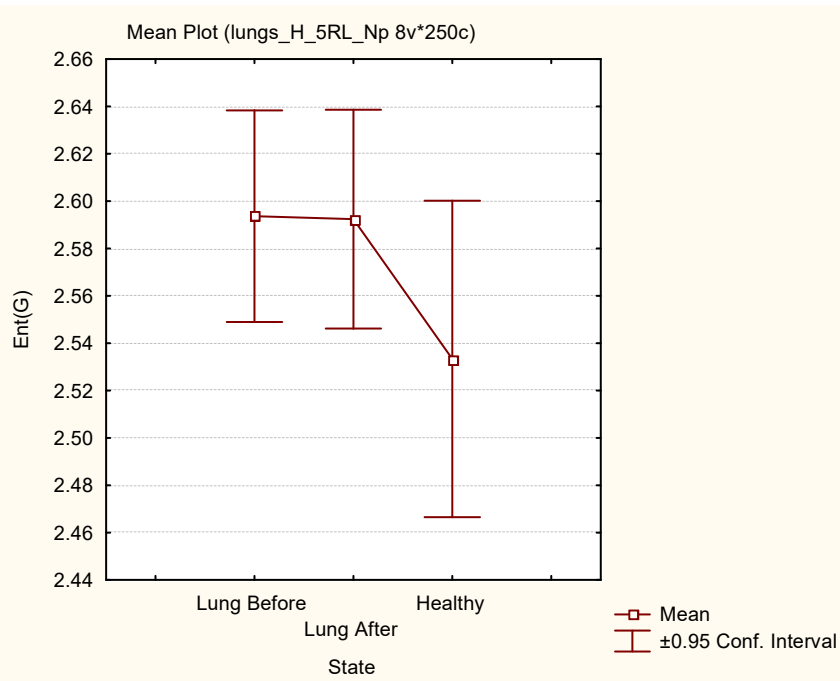
**Appendix 5.**
**Claster Analysis of GDV-grams of Cancers Groups:**
**Lungs and Mammary Gland, and Healthy People (both Female and Male).**
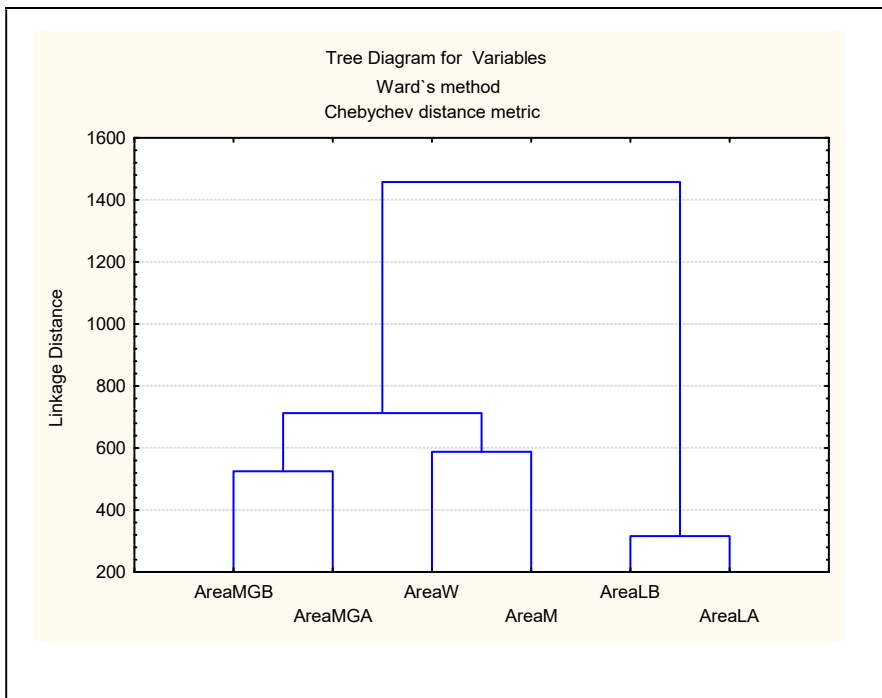


Cluster analysis of the GDV Area.

MGB – breast cancer before treatment;
MGA – breast cancer after treatment;
W - healthy females;
M – healthy males;
LB - lung cancer before treatment;
LA – lung cancer after treatment.
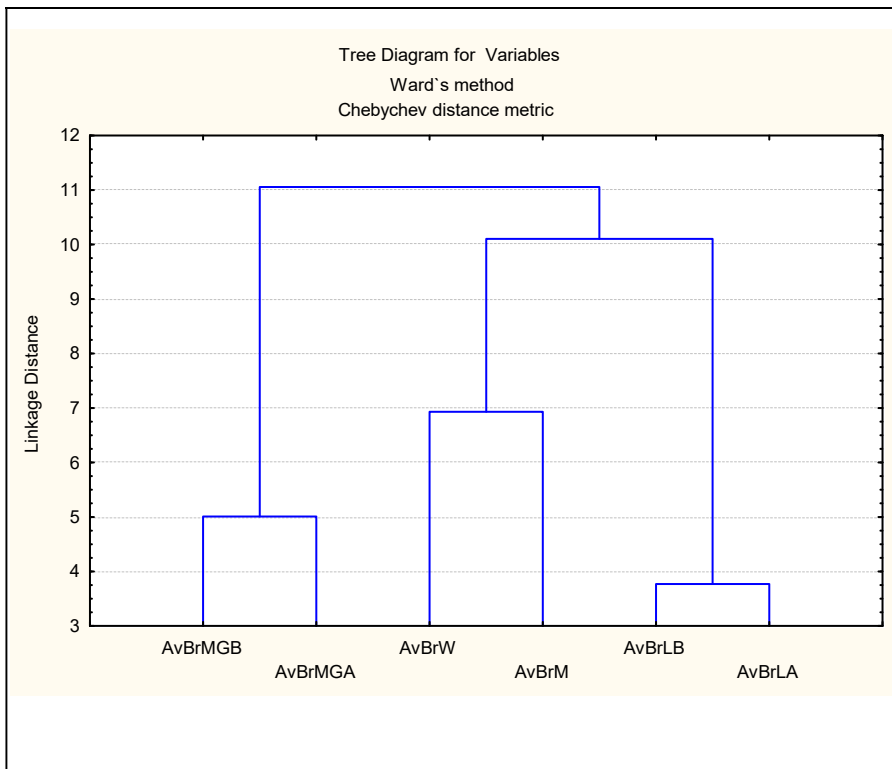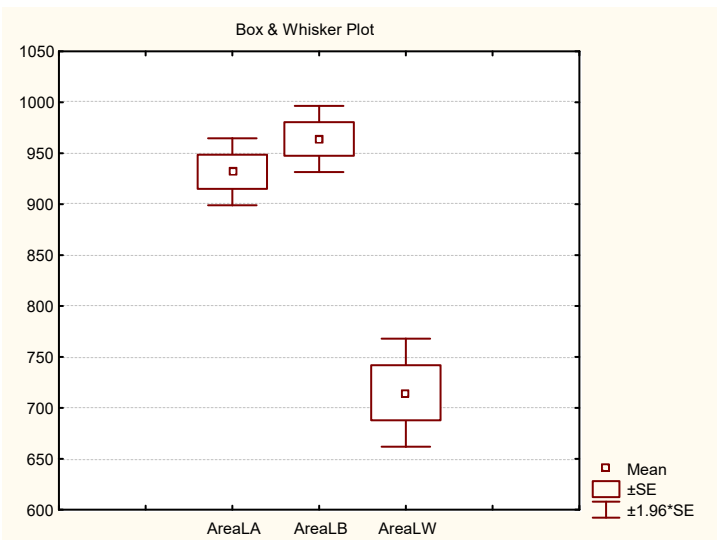


Cluster analysis of the GDV Brightness.

Fig. 1. GDV Area for Breast Cancer group before (B) and after (A) treatment and Healthy group (W), 5L finger
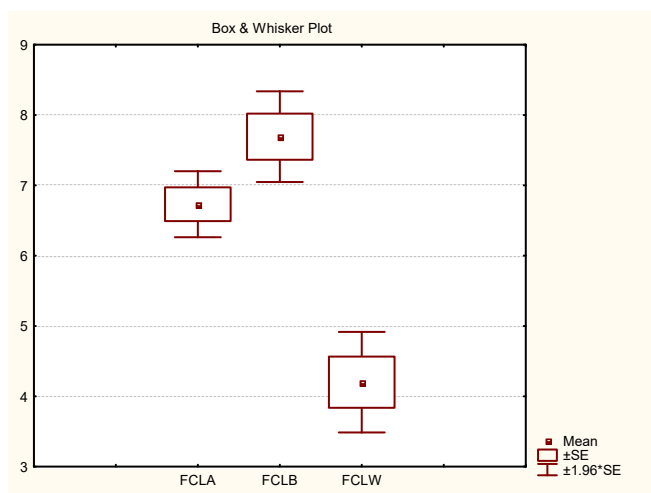


Fig. 2. GDV Form Coefficient for BC group before (B) and after (A) treatment and group of Healthy Women (W),
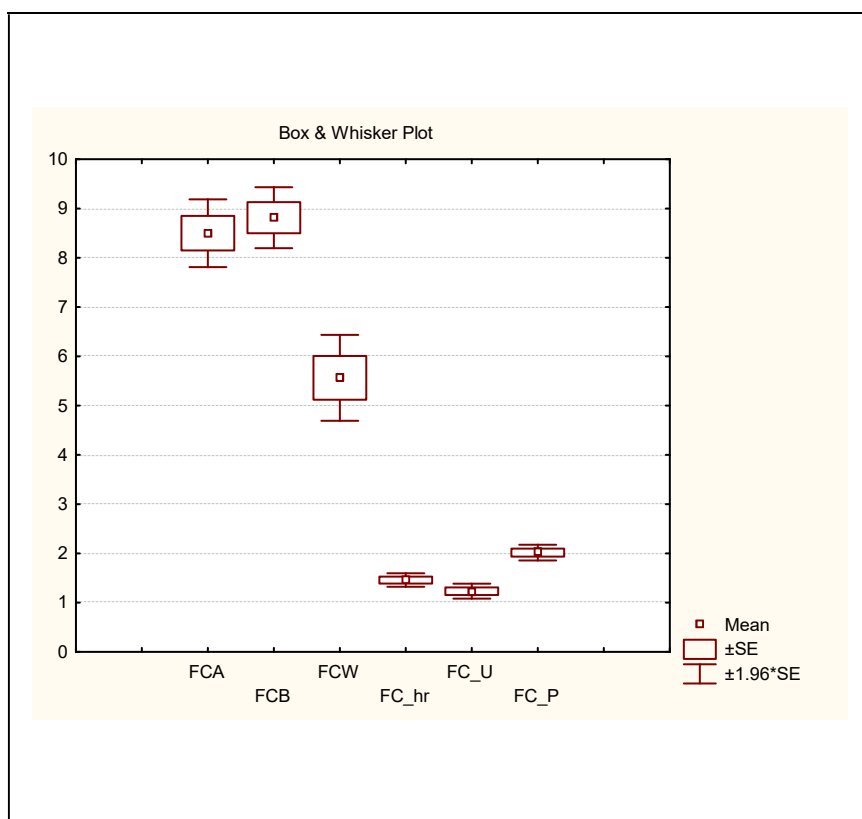5L finger



Fig.3. Comparison of different nosological groups on GDV Form coefficient for the 5R finger
B – Breast Cancer group before treatment
A – Breast Cancer group after treatment
W – control group of practically healthy women
hr – group with heart problems
U – group with urological problems
P – happy group of pregnant women

Tree Diagram for Variables
Ward`s method
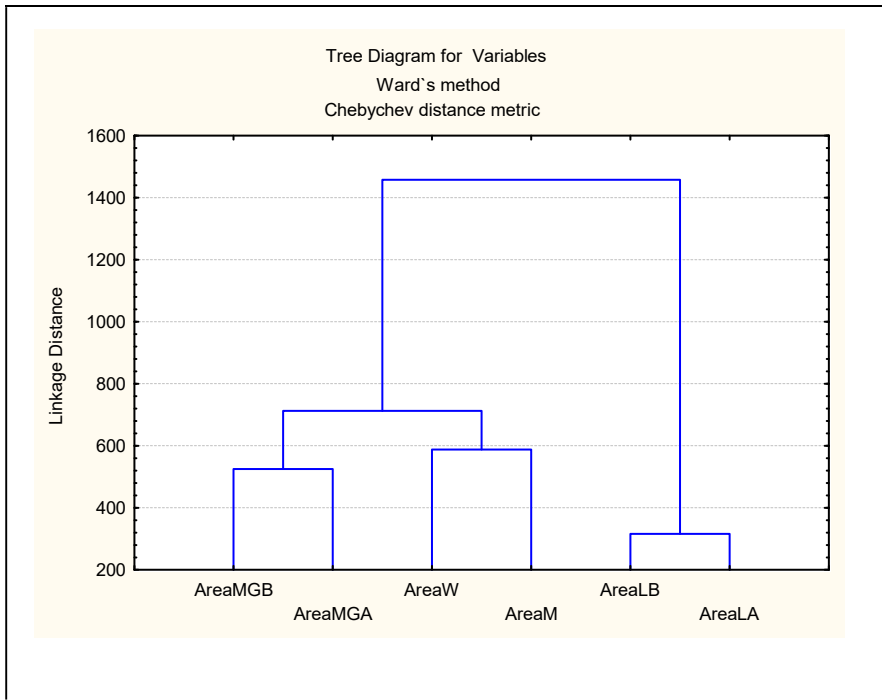Chebychev distance metric

FIG.4. Cluster analysis of the GDV Area.

MGB – breast cancer before treatment;
MGA – breast cancer after treatment;
W - healthy females;
M – healthy males;
LB - lung cancer before treatment;
LA – lung cancer after treatment.