

OPINION

from

Prof. Radoslav Y. Georgiev, MD, PhD, Department of Diagnostic Imaging and Interventional Radiology, Medical University, Varna,

member of the Scientific Jury, according to Order No. R-109-268/05.08.2024. of the Rector of the Medical University – Varna, and according to Protocol No. 1/19.08.2024 elected to prepare an opinion in connection with the acquisition of the degree of Doctor by Dr. Dimitrina Nikolova Markova for the field of higher education 7. Health and Sports, professional field 7.1 Medicine and specialty "Medical Roentgenology and Radiology /incl. use of radioactive isotopes/"

on the dissertation:

"CT Assessment of Abdominal Adipose Tissue, Bone Density and Sarcopenia"

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Supervisor: Assoc. prof. Chavdar Bachvarov, MD, PhD, Specialty Diagnostic Imaging, Head of the Clinic of Diagnostic Imaging and Interventional Radiology at the University Hospital "St. Marina" – Varna, Varna Varna, blvd. 1 H. Smirnenski Str., Head of the Department of Diagnostic Imaging and Interventional Radiology at MU – Varna, email: chavdar.bachvarov@mu-varna.bg

1. Brief biographical information about the candidate:

Dr. Dimitrina Markova was born on 11.07.1981. She graduated the Technical School of Veterinary Medicine in Lovech in 2000. In 2011 she graduated with honors in medicine from the Medical University - Pleven. From 2011 to 2015 she worked as a resident physician in the Department of Diagnostic Imaging and in the Emergency Department at the "Dr. Bratan Shukerov" Hospital in Smolyan. Since 2015 she has been a doctor at the Clinic of Diagnostic Imaging at the University Hospital "St. Marina" Varna. From 2018 to the present she has been an assistant physician at the Clinic of Diagnostic Imaging at the University Hospital "St. Marina" Varna. In 2018, she acquired a specialty in Diagnostic Imaging. Since 02.11.2020 she has been enrolled as a full-time PhD student at the department. Her research interests are in the field of Breast Imaging, Abdominal Imaging, Female Pelvic Imaging and Pediatric Imaging.

2. Dissertation of the topic and social significance:

The topic of the presented dissertation is relevant and of scientific and applied value, concerning global problems of humanity such as obesity, osteoporosis and sarcopenia. It is based on the use of routine abdominal CT to quantify the volumes of visceral and

subcutaneous adipose tissue, important in conditions such as obesity, insulin resistance and lipodystrophy, associated with an increased risk of cardiovascular and oncological diseases. Measuring bone density by CT, using phantoms, and segmenting the body of L3 in Slicer 3D is an important predictor of future fracture risk. Sarcopenia, a condition characterized by loss of muscle mass, strength, and function, is directly related to age and physical activity, and is associated in chronically ill patients with colorectal cancer, lung carcinoma and pancreatitis. In these patients, there is a significant relationship between the early diagnosis of this condition and the prognosis, quality of life and outcome of the disease.

The objective: "To assess the parameters of abdominal adipose tissue, bone density and sarcopenia by low-dose CT of the abdomen and to analyze the relationship between them in patients with colorectal carcinoma, lung carcinoma and patients with chronic pancreatitis" points to the discovery of links between a fundamental physiological process such as fat metabolism and carcinogenesis and inflammation. For the implementation of the goal, six tasks have been formulated that correspond to the direction, develop the concept and allow its implementation.

3. Structure of the dissertation:

The dissertation is presented on 208 pages. The work generally follows the classical structuring of a work of this type, as the main sections are in the following volumes: Introduction - 2 pages, Literature review - 72 pages, Purpose and objectives - 1 page, Material and methods - 9 pages, Results and Discussion - 64 pages, Conclusions - 2 pages, Conclusion - 2 pages, Contributions - 1 page, participation in projects, publications related to the dissertation and participation in scientific forums - 1 page, and bibliography - 41 pages. The work is well illustrated with 4 tables and 82 figures. 511 literary sources were used, of which 1 in Cyrillic and 510 in Latin.

The abstract of Dr. Dimitrina Markova is prepared on 74 pages, standard size. Its structure copies the structure of the dissertation - without the literature review. Its content is the core of the presented dissertation, as the main and most important points are conveyed, which clearly and accurately present the essence of the problem.

4. Knowledge of the problem:

In the literature review, Dr. Markova has very thoroughly studied the available data in the literature, citing 511 sources. The very small number of publications on the topic in Bulgarian sources is impressive. Emphasis is placed on the correlation between imaging studies and the assessment of abdominal adipose tissue, osteoporosis and sarcopenia in patients with oncological diseases such as colorectal cancer, lung carcinoma, patients with chronic pancreatitis and controls.

5. Material and methods of research:

In the chapter with the materials and methods are presented 96 patients examined in the Clinic of Diagnostic Imaging at the University Hospital "St. Marina" with low-dose abdominal CT. Patients are divided into four groups:

- patients with colorectal cancer – 22 people;
- patients with lung cancer - 18 people;

- patients with chronic pancreatitis – 20 people;
- control group – 36 people. The control group included healthy volunteers.

The first three groups of patients were selected retrospectively and examined on computed tomography systems of Siemens Spirit, Somatom Definition and Somatom Force, and the last control group was examined prospectively, using a computed tomography system of Siemens - Somatom Force. For statistical processing, IBM SPSS v.20 software was used.

6. Evaluation of the dissertation:

Dr. Markova describes and analyzes the data obtained on the six tasks set in the chapter Results. A significant difference and dependence was found between the volume and density of subcutaneous and visceral adipose tissue, and the diseases in the studied groups of patients. There is an inversely proportional relationship between the volume and density of subcutaneous and visceral adipose tissue, and an increase in volume leads to a decrease in density, which is more pronounced for visceral adipose tissue. A significant difference and moderate relationship was found between the HUAC (Hounsfield Units Average Calculation) and the diseases in the studied groups of patients: the lowest values were in patients with colorectal cancer (40.5), and the highest value was in the control group (48.57). Female sex and old age are associated with a higher risk of developing sarcopenia. A moderate relationship between female sex and the Psoas Index and an inversely proportional moderate relationship between age and the Psoas Index in men was found. A statistical relationship between bone density and sex ($r=-0.454$; $p<0.001$) was established, which indicates that it decreases in women. In both sexes, a directly proportional moderate relationship was found between the bone density of the L3 body and age. A statistically significant association was found between TDC (visceral adipose tissue), L3 bone density, PMT (subcutaneous adipose tissue) and inflammatory markers and blood sugar levels: increased TDC volume was associated with elevated CRP values, decreased L3 bone density was associated with high ESR values, and blood sugar levels were related inversely proportional to subcutaneous fat volume and directly proportional to PMT density.

Dr. Markova presents 6 conclusions that correspond exactly to the goals and objectives set.

Dr. Markova presents 3 publications connected with the dissertation. All of them have been published in Bulgarian scientific periodicals. She also has two participations in scientific forums in Bulgaria, as well as participation in a scientific project in Bulgaria. The procedure for conducting doctoral studies has been followed: Dr. Markova has covered the candidacy minimum and has been expelled with the right to defense by Order No. R-109-268 of 05.08.2024 of the Rector of MU - Varna.

7. Contributions and significance of the dissertation:

Dr. Markova's dissertation has a theoretical, practical and original contribution. For the first time in Bulgaria, the correlation between CT indicators for assessing abdominal adipose tissue, bone density and sarcopenia, and their relationship with oncological diseases and chronic pancreatitis has been described.

8. Critical Notes and Recommendations:

I don't have any.

9. Conclusion:

Taking into account the above arguments, I give my **positive** assessment of the conducted research and I strongly recommend the members of the esteemed scientific jury to award the educational and scientific degree of "Doctor" to Dr. Dimitrina Markova.

Заличено на основание чл. 5,
§1, б. „В“ от Регламент (ЕС)
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03.10.2024
Varna

Prepared the opinion: _____
Prof. D-r Radoslav Y. Georgiev, MD, PhD