

**”VICTOR BABEȘ” UNIVERSITY OF
MEDICINE AND PHARMACY TIMIȘOARA
DOCTORAL SCHOOL
MEDICINE DOMAIN**



**IMPLICATIONS OF MEDICAL IMAGING AND
RADIOLOGY IN CLINICAL PRACTICE AND
MULTIDISCIPLINARY SCIENTIFIC RESEARCH**

ABSTRACT

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**Timișoara
2023**

THESIS SUMMARY

My name is Malița Daniel-Claudiu, and I was born in Chișineu-Criș, Arad County, in 1973. After completing my high school education at the "Constantin Diaconovici Loga" National College in Timișoara in 1992, I gained admission to the Faculty of Medicine at the University of Medicine and Pharmacy "Victor Babeș" Timișoara in the same year.

My attraction to the field of Radiology and Medical Imaging began during my university studies, particularly after my practical internship experience in this field at the County Emergency Hospital Timisoara. Subsequently, following the completion of my university studies, I chose this domain as my specialty following the residency exam. As a result, after successfully concluding my residency training in 2005, I passed the specialty exam and obtained the title of specialist in Radiology and Medical Imaging. Since 2010, I have held the position of a primary care physician in this specialized field.

I started my Ph.D. studies in 2003, my doctoral thesis being entitled "Radio-imaging and clinical correlations in the evolution and complications of total hip and knee arthroplasty". This thesis was awarded in 2008, under the scientific supervision of Prof. Univ. Dr. Mogoșeanu Maria and was confirmed by the Order of the Minister of Education no. 4887 / 25.07.2008.

The habilitation thesis, titled "**Implications of Medical Imaging and Radiology in Clinical Practice and Multidisciplinary Scientific Research,**" serves as the culmination of my scientific, professional, and academic endeavors, with a particular focus on accomplishments achieved following the attainment of my Ph.D. in Medicine (2008 - present).

This thesis adheres to academic conventions and is structured into four distinct sections:

- i) The first section is dedicated to my scientific contributions and research work.
- ii) The second section highlights my achievements and contributions within the academic sphere.
- iii) The third section delves into my professional engagements and accomplishments.
- iv) The final section outlines a comprehensive plan for the development of my academic career.

Chapter 1 covers the main postdoctoral scientific research achievements and covers the primary areas of research, presenting original studies, articles published in international journals, indexed Clarivate Web of Science - ISI, and scientific papers presented at national and international congresses, in the current scientific context of Radiology and Medical Imaging. In this chapter, we also find materials of interest other than those. These are original and innovative works in the areas of secondary research of which we were the main author and important methods of mass dissemination, such as textbooks or course materials.

This chapter also provides an account of the progression of my scientific development, achievements, and the recognition I have garnered both nationally and internationally. Over the course of my professional, medical, scientific, and academic career, I have actively participated in numerous national and international congresses, contributing to poster sessions, delivering oral presentations, and serving as an invited speaker.

With respect to the significance and impact of my scientific findings, my selected research topics have traversed multidisciplinary pathways and encompassed various facets of Radiology and Medical Imaging. These topics involve intricate and multidisciplinary intersections, substantiated by the publication of books and articles that bear testament to the originality, relevance, incorporation of scientific concepts, high scientific rigor, synthesizing capacity, and comprehensive approach to subjects within the field.

As regards the scientific papers, I have published 39 in extenso articles, as the main author or in collaboration with other authors, in Clarivate Web of Science indexed scientific journals and 20 in extenso papers in BDI, international databases indexed in scientific journals. In addition, I have published 7 articles in BDI indexed journals supplements and 6 articles in proceeding volumes indexed Clarivate Web of Science. The publications in the various international ISI journals have had a scientific impact and are recognized, accumulating a total of 283 citations in the ISI Web of Science system and a Hirsch index= 11. I have held scientific events and participated in the patenting of an electronic medical device. In addition, I have written and published as lead author a chapter in a treatise and 4 monographs as co-author, in CNCSIS-recognized publishers.

I have a keen interest in exploring the practicality of radiological and imaging techniques in both clinical practice and research. Consequently, the initial segment of

this chapter spotlights my scientific accomplishments in two distinct research directions I have pursued recently: "Medical Imaging in Cancer Clinical and Research" and "Radiologic Applications in Pulmonology and Infectious Disease Research."

The research is original, innovative, and valuable as it contributes to our understanding of the field of Radiology and Medical Imaging, particularly concerning the cancers, pulmonary and infectious disease.

Firstly, based on the knowledge acquired during the preparation of my PhD thesis, I continued my research on the involvement of imaging in clinical practice and medical research, broadening the horizons towards oncological, pulmonary and infectious pathology. In recent decades cancer has become a global public health problem, medical imaging being a cornerstone in the comprehensive management of this pathology. On this topic we have published studies covering several types of cancers, such as studies on multiple myeloma, lung cancer or breast cancer.

Regarding multiple myeloma, I have published as lead author the manuscript, **„Whole-body diffusion-weighted magnetic resonance imaging and apparent diffusion coefficient values as prognostic factors in multiple myeloma”** (Experimental and Therapeutic Medicine, IF= 2.447). The study concludes that negative prognostic factors in whole-body MRI are high ADC values before treatment (for each ADC point, survival decreased/reduced by 14.5 months) and focal/diffuse marrow involvement. In addition, positive prognostic factors are represented by normal-appearing bone marrow and low ADC values before treatment.

Furthermore, recognizing that a significant proportion of global cancer diagnoses and cancer-related fatalities are attributed to lung cancer, I directed my focus towards this critical area of research. This effort culminated in the publication of the article titled **"Predictors of the Response to Nivolumab Immunotherapy in the Second or Subsequent Lines for Metastatic Non-Small Cell Lung Cancers"** in the journal Experimental and Therapeutic Medicine, IF= 2.447. In this study, medical imaging played an indispensable role in the research methodology, underscoring its pivotal role in advancing medical research.

The findings of this study revealed that several factors, including the presence of adrenal and liver metastases, neutrophilia at baseline, an absolute increase in lymphocyte count at 6 weeks of treatment, the presence of brain metastases, and the

number of organs affected by metastases, serve as negative predictors for the duration of nivolumab treatment, offering valuable insights into patient outcomes.

Moving on, I delved into the realm of medical imaging within the context of another prevalent form of cancer, breast cancer. I authored a systematic review titled **"Breast Cancer—How Can Imaging Help?"** published in the journal *Healthcare*, IF= 2.8. In this comprehensive review, we meticulously examined crucial data related to the role of various imaging modalities in breast cancer, including mammography and computed tomography, ultrasound and elastography, MRI, ultrasound-guided biopsy, PET-CT, and PET-MRI.

The review also included a meticulous comparison of the advantages and disadvantages associated with these imaging methods employed in the management of breast cancer. In summation, the review underscores the potential for enhanced outcomes in individuals diagnosed with breast cancer through the judicious utilization of these imaging techniques, coupled with their ongoing advancements.

Furthermore, I also studied less common cancers such as bone and soft tissue cancers. On this topic I have published the following articles: **„Conventional chondrosarcoma in the right hand with the invasion of the pisiform and the hamate bones - case report.”** (Rom J Morphol Embryol); **„Conventional grade 1 chondrosarcoma: a challenging diagnosis with important implications on therapy and prognosis.”** (Rom J Morphol Embryol.); **”The role of immunohistochemistry in the diagnosis and management of synovial sarcoma.”** (Rom J Morphol Embryol.); **”Alveolar rhabdomyosarcoma in an adolescent male patient - case report and current perspectives.”** (Rom J Morphol Embryol).

Given the rarity of these pathologies and my specialized focus on specific subtypes within these disease categories, my publications have predominantly taken the form of case reports. In these publications the diagnostic radiological methods used are comprehensively presented with images.

In the second line of research that I have pursued in recent years, I have centered my attention on exploring the role of medical imaging in the fields of pneumology and infectious diseases. The examination of medical imaging's involvement in infectious diseases has assumed pivotal significance, particularly in light of the recent global COVID-19 pandemic.

One of the key studies conducted in this domain, titled "**Correlation of Lung Damage on CT Scan with Laboratory Inflammatory Markers in COVID-19 Patients: A Single-Center Study from Romania**" and published in the Journal of Clinical Medicine (IF= 3.9), aims to evaluate the relationship between lung lesions observed on CT scans and changes in inflammatory markers. The study findings indicate a correlation between inflammatory markers and lung damage as depicted on chest CT scans, suggesting that these markers can serve as valuable tools for assessing the severity of COVID-19.

The exploration of medical imaging's role in pulmonology has been greatly motivated by the imperative to enhance our comprehension of pulmonary fibrosis. As part of this endeavor, I have authored the study titled "Ultrasound Mapping of Lung Changes in Idiopathic Pulmonary Fibrosis," which was published in the Clinical Respiratory Journal. The study findings underscore the reliability of lung ultrasound as an imaging tool for mapping lung alterations associated with idiopathic pulmonary fibrosis. When compared to high-resolution computed tomography (HRCT), lung ultrasound demonstrates notable correlations, particularly in relation to the distribution of B-lines and the mean pleural line thickness, which serve as ultrasound markers for interstitial fibrotic syndrome. These markers exhibit strong and positive correlations with HRCT, forced vital capacity (FVC), and diffusing capacity of the lungs for carbon monoxide (DLCO).

Furthermore, my post-doctoral research has extended beyond the confines of my primary research directions, encompassing the multifaceted applications of radiology and medical imaging across various other medical specialties. This expansion has been motivated by the acknowledgment of the versatile and interdisciplinary nature of medical imaging, with the aim of harnessing its potential to enhance diagnostic accuracy, treatment planning, and patient care in specialties such as:

- Obstetrics ("**The added value of using Fusion-DWI technique in day to day practice for appreciating placental invasion of the myometrium**") E-Health and Bioengineering Conference; "**A survey to assess the incidence of Down syndrome risk in rural southwestern Romania**" - Experimental and Therapeutic Medicine; „**Cesarean Scar Ectopic Pregnancy Associated with a Uterine Arteriovenous Fistula: Case Report.**" - PROCEEDINGS OF SOGR 2018),

- Surgery (***„MRI Surveillance of Plastic Material Surgical Meshes: Experimental Model - Interim Results.”*** Mater. Plast.)
- Internal medicine (***„Patient-Specific Image-Based Computational Fluid Dynamics Analysis of Abdominal Aorta and Branches.”*** Journal of Personalized Medicine; ***„Significant Association between Subclinical Left Cardiac Dysfunction and Liver Stiffness in Metabolic Syndrome Patients with Diabetes Mellitus and Non-Alcoholic Fatty Liver Disease.”*** Medicina)
- Orthopaedics (***„Deep vein thrombosis following the treatment of lower limb pathologic bone fractures – a comparative study.”*** BMC Musculoskelet Disord.; ***„Large giant cell tumor of the posterior iliac bone – an atypical location. A case report and literature review.”*** Rom J Morphol Embryol.; ***"Persistent bone edema, anterior tibial pain and delay in bone neo-formation associated with Poly-L-lactic acid screws fixation of the anterior cruciate ligament graft,"*** 2017 E-Health and Bioengineering Conference).

Chapter 1 further provides an overview of all the postdoctoral scientific endeavors I have undertaken, spanning a wide spectrum of medical radiology and imaging. My postdoctoral research efforts have encompassed various themes beyond the primary focus on the implications of imaging in clinical practice and medical research, branching out into additional areas. These secondary research interests have expanded the scope of investigation to encompass diverse facets of infectious diseases, as well as studies related to therapeutic agents, with a particular emphasis on cancer.

Chapter 2 provides insights into the academic advancements and achievements that have characterized my career. It outlines the progression through various stages of the academic hierarchy, starting with my appointment as a university tutor in the Department of Radiology and Medical Imaging at the University of Medicine and Pharmacy "Victor Babes" in Timisoara in 2003. This journey continued with my elevation to the position of assistant professor within the same discipline in 2006, followed by my attainment of the title of lecturer in 2011. Most recently, since 2021, I have held the esteemed position of Associate Professor in the Department of Radiology and Medical Imaging at the University of Medicine and Pharmacy "Victor Babes."

Throughout my academic tenure, I have actively participated in the adaptation and modernization of teaching activities, aligning them with contemporary European

and international standards and models. I have contributed to the development of teaching materials and the creation of new courses. Furthermore, I have assumed the role of coordinator for student and resident doctor research papers presented at various scientific events, as well as numerous diploma papers. Additionally, I have been involved in committees responsible for specialist examinations, primary examinations, and licensing examinations, underscoring my commitment to academic excellence and mentorship.

Chapter 3 delves into my post-doctoral professional development and noteworthy achievements. In 2005, I achieved the status of a specialist in radiology and medical imaging, and since 2010, I have held the role of a primary care physician in this specialized field. My professional competence and leadership abilities are further demonstrated by my managerial roles. Specifically, in 2010 and from 2020 to the present, I have served as the manager of the Municipal Emergency Clinical Hospital in Timisoara, highlighting my experience in healthcare administration and leadership.

Chapter 4 elaborates my plans for the evolution and development of my teaching and research career. Teaching is a noble profession, which can only be achieved with dedication and passion. Maintaining, improving, and developing the quality of a teacher can only be achieved through personal development that is born from a burning motivation and a strong inner desire for continuous improvement. Therefore, I must continue research in the field of obstetrics and gynecology along with the development of current and future clinical and scientific practices.

The integration of graduates into the medical labour market, by making use of the skills acquired during their studies, is a great achievement of university activities. It is therefore important to adapt the educational offer to the quality and performance requirements of modern medicine. Personally, this means high-level professional training. It is imperative to continuously develop the method of training students in the field of obstetrics and gynecology, towards teaching and learning of specialist concepts in accordance with European and international standards.

Through the future coordination of doctoral theses, I believe that I will be able to stimulate the work of new doctoral students, which will lead to the dissemination of the results of doctoral research in the scientific environment, both nationally and internationally. Last but not least, this opportunity will also help increase the visibility of the University. Interdisciplinary collaboration, multidisciplinary and innovative

evidence-based research are at the heart of my desire to be able to guide and help future PhD students.

Bibliographical references, used to describe the research activities described in the previous sections, can be found at the end of this paper.