

**UNIVERSITY OF MEDICINE AND PHARMACY
“CAROL DAVILA” BUCHAREST**



HABILITATION THESIS

**THE ROLE OF MOLECULAR DIAGNOSTICS
AND TECHNOLOGICAL INNOVATIONS IN
NEUROSURGERY**

Summary

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The habilitation thesis entitled "The role of molecular diagnostics and technological innovations in neurosurgery" reveals the interest and research directions of my scientific, professional and academic career in the last 20 years and summarizes the most important scientific results obtained in my research activity.

This habilitation thesis is structured in four sections.

Section I consist in a summary of my scientific research activity that I have carried out over the last 20 years. Since I was a young neurosurgery resident, I have been involved in scientific research activities, revealing a particular interest in studying the molecular mechanisms involved in glioblastoma oncogenesis. In 2005, I obtained through a competition the position of research assistant in the neurosciences research core of the "Bagdasar-Arseni" Clinical Emergency Hospital; then, in 2007, I was promoted to the position of scientific researcher. In 2010 I defended my PhD thesis entitled "The role of cellular and molecular therapies in multimodal treatment of glioblastoma". After obtaining the title of Doctor in Medicine, I continued and improved my research activity on cerebral gliomas, with interest in studying the development of *in vivo* and *in vitro* models of glioblastoma, in the identification of oncogenic markers of invasiveness and recurrence in glioblastoma, combining my research field with my clinical activity.

I have been involved in national and international research projects, both as project director (3 projects), project manager (1 project) and as a member of the research team (10 projects). I have published the results of my research work in ISI and IBD-indexed journals. Thus, I have published 22 ISI indexed articles (13 of them as the main author), achieving a cumulative impact factor as the main author of 38,828 and a Hirsch index = 8. I have also published 31 articles in IBD-indexed journals. I have written 156 papers (as main author or co-author) that have been presented at national and international conferences or congresses. Abstracts of some of these papers presented at specialized conferences were published in ISI indexed journals (22 abstracts).

Section II summarizes the main publications that have resulted from my research work, with emphasis on the postdoctoral period – books, book chapters and articles published in ISI or IDB - indexed journals.

I have published 3 books, of which 1 by international publisher: “Experimental models in glioblastoma research”, “Stereotactic Neurosurgery” and “Neurosurgical Tumor Pathology Guide”. I also published 5 book chapters. As a recognition of my research activity I was invited as a reviewer of some ISI indexed journal (APMIS, Neurological Research, Frontiers in Oncology).

I am also member of the Executive Committee of the European Society for Stereotactic and Functional Neurosurgery (ESSFN).

Section III describes my academic and professional activity. I became Assistant Lecturer in 2011 and then, in 2017, I obtained the position of Lecturer. Starting with March of 2024 I am Associate Professor at University of Medicine and Pharmacy "Carol Davila". I am currently the head of the Neurosurgery 1 department at the "Bagdasar-Arseni" Clinic Emergency Hospital Bucharest.

From the beginning of my teaching career to date I have been involved in over 500 hours of didactic activities and professional training for both students and resident doctors. I have involved young neurosurgeon residents in research projects, some residents choosing the topic of their PhD thesis from the research themes we have carried out. As a recognition of my didactic and scientific activities, I was invited as speaker at 8 international scientific events.

All scientific research activities and academic achievements were combined with constant professional training. In my training as a neurosurgeon, I completed several internships, among which I mention: clinical and research internship in Marburg (Germany) in 2006, research internship in neuro-oncology at the "University of Virginia" (USA) in 2006, training course in stereotactic neurosurgery at the Grosshadern University Clinic in Munich (Germany) in 2008, hands-on microsurgery courses (cranial base microsurgery course, Zurich, Switzerland 2010 – Course director: Prof. Dr. H. Bertalanffy, Vascular and Skull Base Microsurgery Course, Walter E. Dandy Neurosurgical Society, Saint Louis 2013 – Course Director: Prof. Saleem Abdulrauf), hands-on endoscopy and stereotactic neurosurgery courses.

Neurosurgery is a particularly technologically intensive surgical discipline and in recent years technological innovations have significantly modulated surgical approaches. In my neurosurgical practice I frequently use the Neuronavigation System (Medtronic) integrated with the Zeiss Kinevo 900 Operating Microscope to improve the rate of tumor resection. I also use the Qevo® micro-inspection tool in many cases (aneurysm surgery, brain tumor surgery or microvascular decompression) to optimize the surgical procedures, to facilitate visualization of critical neurovascular structures or to perform a safe and complete excision of tumors located in narrow, hard to reach areas. Technological innovations help to improve surgical decisions.

I have a particular interest in brain tumor surgery, neurovascular surgery but also in stereotactic and functional neurosurgery, having experience with deep brain stimulation (DBS)

techniques, vagus nerve stimulation (VNS) technique and with intrathecal drug delivery systems. I performed beyond 1000 neurosurgical interventions over the period of 2017-2023 (of which approximately 550 brain surgeries: gliomas, metastases, meningiomas, neurinomas, vascular pathologies, microvascular decompressions). I have good skills in stereotactic neurosurgery, with the largest national experience - about 500 brain biopsies performed with both frame-based and frameless systems (navigation-guided biopsy).

Regarding epilepsy surgery, I performed procedures such as temporal lobectomy and amygdalohippocampectomy; I also performed vagus nerve stimulation (VNS), "Bagdasar-Arseni" Clinical Emergency Hospital becoming a national reference center, with the largest number of VNS devices.

Section IV presents the development directions I propose for my future scientific, professional and academic career. Regarding the career development project, I anticipate two important directions for future research activity: I aim to continue research in the molecular field of glioblastoma, also expanding research to other brain tumor; I also aim to improve my training in the use of modern technologies in oncologic and functional neurosurgery.

Regarding the scientific activity, I will consider the continuation of research projects with subsequent publication of the results in scientific papers, the initiation of new collaborations with other research institutes, the development of the clinic's research laboratory by purchasing new research equipment in order to introduce modern molecular analysis techniques. I will support young residents and PhD students to develop their skills and interest in research activity.

Regarding the professional activity, I will continue to perfect my surgical skills by participating in training courses in microneurosurgery and in the field of stereotactic, functional and minimally invasive neurosurgery. I will also participate in training courses in the field of modern innovative technologies.

Regarding the didactic activity, I am looking to improve the curriculum in the neurosurgery discipline and to introduce modern techniques in the teaching process, perhaps to introduce the possibility of live streaming from the operating room in order to increase the interest of neurosurgical residents/students. I also aim to involve students and residents in fundamental research activity.

My goal and hope is that through this stage of my university career I will ensure a continuity of scientific research that will translate into PhD theses of great academic value.