ABSTRACT

The habilitation thesis entitled **"Modern Radiology in Personalised Medicine: Contributions Regarding the Role of Artificial Intelligence, Inflammatory Biomarkers, and Imaging–Surgical Integration"** synthesises my professional, teaching, academic, and scientific trajectory, as well as the main research directions pursued in radiology and medical imaging.

The thesis is centred on the principle that has underpinned all the research projects undertaken, namely a constant commitment to integrating modern imaging and artificial intelligence into personalised medicine, while strengthening interdisciplinary collaboration among radiologists, clinicians, surgeons, pathologists, and researchers.

The overarching direction of the work is to harness imaging, clinical, biological, and histopathological data to develop predictive models and individualised therapeutic strategies tailored to each patient's profile.

The thesis is organised into three distinct parts.

The first part presents my professional, scientific, and academic achievements and is structured into two major components: the academic, professional, and scientific profile, and the original contributions.

My clinical professional activity, as a senior physician in radiology and medical imaging, focuses on the imaging evaluation of complex pathologies and the integration of information from computed tomography, magnetic resonance imaging, and ultrasonography into the medical decision-making process. The clinical experience accumulated over time has supported the development of applied research topics, particularly in pulmonary, abdominal, pelvic, oncological, and reconstructive pathology.

My teaching and academic activity initially took place within the Department of Anatomy and Embryology and subsequently within the Department of Radiology, as part of an academic career that progressed from Assistant Professor to Associate Professor. My teaching activity has aimed to modernize the educational process through the delivery of courses and practical sessions in anatomy and radiology, the development of teaching materials, the publication of books intended for students and residents, the use of e-learning platforms, and the integration of interactive teaching methods. Throughout my career, I have supervised bachelor's and dissertation theses, participated in admission committees, student assessment committees, and academic recruitment committees, as well as in specialist committees in the field of Radiology and Medical Imaging, including those related to senior physician examinations and the awarding of complementary study certificates in CT and MRI.

My scientific and research activity is structured around several complementary directions, as follows: artificial intelligence and advanced imaging in personalized

medicine; inflammatory biomarkers as predictive tools in medico-surgical pathology; imaging–surgical integration in pelvic and colorectal pathology; and the use of biomaterials in surgical reconstruction. These directions are centred on a common foundation that reflects the role of modern imaging throughout the entire medical process, with imaging being not merely a descriptive tool, but also a source of quantitative, predictive, and prognostic data.

Chapter I is dedicated to artificial intelligence and advanced imaging in personalised medicine. The chapter provides a concise overview of the conceptual foundations of artificial intelligence in radiology and of the aspects related to its integration into the imaging workflow. My personal contributions include two main studies focused on quantifying pulmonary involvement, ranging from visual computed tomography severity scores to artificial intelligence-based algorithms, with applicability to the assessment and management of patients with SARS-CoV-2 infection. The results of this research led to the publication of two articles in journals with an impact factor: one article in a Q1 journal, which has accumulated 43 citations in Web of Science, and one article in a Q3 journal. Part of this research was funded through an internal research grant.

Chapter II analyses inflammatory biomarkers as predictive tools in medico-surgical pathology. The research presented includes four main studies addressing the role of inflammatory markers in abdominal trauma, in the prediction of acute kidney injury and mortality, in the assessment of the severity of abdominal and splenic trauma, in acute appendicitis, and in peripheral vascular pathology.

The results of this research materialised in the publication of four articles in journals with impact factor, classified in the Q2, Q3, and Q4 quartiles.

Chapter III addresses advanced imaging and imaging–surgical integration in pelvic and colorectal pathology through two main studies published in impact-factor journals, both classified in the Q1 quartile. The chapter concludes with a presentation of future perspectives on the use of artificial intelligence in pelvic and oncological pathology, emphasising the potential of segmentation, classification, and prediction algorithms to support personalised medicine.

Chapter IV approaches the use of biomaterials and surgical reconstruction from anatomical, clinical, and therapeutic perspectives. It comprises two research directions: the first concerns the prevention of bronchial stump fistula following major pulmonary resections by using polypropylene as external support for the bronchial stump, while the second concerns the use of biomaterials in abdominal wall reconstruction, with applications in the treatment of incisional hernias. The results of this research led to the publication of two studies in journals with an impact factor, classified in the Q3 quartile.

Each of the most important research directions presented in Chapters II–IV also includes a dedicated subchapter presenting works related to the main research topic, reflecting the development of a distinct personal research direction.

The second part of the thesis presents the development plans for my academic, scientific, and professional career. The teaching objectives focus on the modernisation of the educational process, the use of e-learning platforms, the development of educational imaging databases, and the integration of artificial intelligence concepts into the training curriculum. Future research directions aim to further develop studies on artificial intelligence, radiomics, and multimodal models applied to medical imaging, as well as the multicentre clinical validation of AI algorithms. These objectives reflect a sustained commitment to interdisciplinary research, multicentre collaboration, and the dissemination of results in prestigious scientific journals. From a professional perspective, I aim to pursue continuous advancement in radiology and medical imaging, adopt modern techniques, strengthen interdisciplinary collaborations, and remain actively involved in the training of medical residents.

The third part of the thesis comprises the bibliographic references that support the critical analysis of the literature and the integration of my own results within the context of national and international research. Overall, the thesis outlines an academic and scientific profile oriented towards interdisciplinarity, innovation, and clinical applicability, highlighting the role of modern radiology in personalised medicine.