

 <p>UniSR Università Vita-Salute San Raffaele</p>	<p>APPLICATION TO ACT AS SUPERVISOR AND RESEARCH PROJECT PROPOSAL</p>	<p>MO 20-5 ed. 01 del 21/02/2025 PO 20 Page 4 of 9</p>
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PROJECT

Supervisor: _____ Anna Palmisano _____

Title: Advanced Mutidimensional and ultra high resolution
computed tomography to Inspect Cardiopulmonary
Involvement in progressive fibrosing Interstitial Lung
Diseases (AMICI-ILD)

Curriculum: Clinical and Experimental Medicine _____

Link to the personal page of
the University or relevant
hospital site website: <https://www.unisr.it/docenti/p/palmisano-anna>

Description of the Project (max 3,000 characters including spaces)

Background/gap of knowledge

Interstitial lung diseases (ILDs) are common chronic disease with high morbidity and potentially unfavourable outcome also linked to cardiovascular implication. Disease characterization at earlier stages would be useful for promptly set treatment and avoid disease progression. Currently, systematic estimation lung remodelling and related cardiovascular injury in patients affected by ILD lacks, with subsequent delayed diagnosis at more severe and irreversible stages. In particular, High resolution computed tomography (HRCT) despite positive predictive value close to 100% in overt ILDs its application is limited for high radiation dose and lack of quantitative early prognosticators. It does not provide information about cardiovascular disease and cardiac damage, despite high incidence and prognostic implication; hence cardiological evaluation is performed at late stages when symptoms are overt and disease irreversible. Novel technology as Dual Energy-CT and Photon Counting-CT has the potential to improve ILD characterization and prognostication using spectral information and ultra-high resolution potentially able to identify precursors of lung fibrosis. In recent studies we developed a CT protocol able to simultaneously assess coronary artery, myocardial scar and interstitial fibrosis and to improve risk stratification in COVID-19 pneumonia deriving quantitative biomarker of systemic comorbidities and cardiovascular risk from chest CT also using artificial intelligence. A CT method for accurate risk stratification of ILD patients based on a comprehensive evaluation would be useful to guide clinical management. Currently no studies are available.

Rationale and hypothesis

The central hypothesis of the present study is that an innovative CT protocol developed on new generation CT scanner able to provide spectral information at ultra-high resolution about lung and cardiac involvement could significantly improve characterization and risk stratification of patients affected by interstitial lung disease compared to standard approach.



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Aim of the present study is to develop a new protocol able to simultaneously and accurately characterize lung and cardiac involvement in ILD patients, to define the interplay between lung and cardiac remodelling using quantitative biomarker in order to set a multiparametric algorithm to improve risk stratification.

Objectives and specific aims

Specific Aim 1: To develop a low dose image protocol able to characterize IDL related lung parenchyma alteration and to identify new quantitative imaging biomarkers of lung disease severity

Specific Aim 2: To evaluate the prevalence and the spectrum of cardiac disease (ischemic heart disease, cardiac remodelling and dysfunction in patients with ILD) and to assess the relationship between severity of lung involvement and cardiac injury

Specific Aim 3: To develop a CT based multiparametric algorithm for risk stratification of patients with ILD

Expected outcomes

In the present study the development of an advanced CT protocol based on a completely innovative approach and using novel technology (Dual Energy CT and Photon Counting CT) has the promise to provide better image quality at lower dose and to identify new imaging biomarker better related to disease severity and prognosis thank to spectral information and ultra-high resolution. Moreover, the combination with low dose CT scan for

myocardial characterization that we have developed and applied in several clinical setting (emergency, cardiomyopathy, covid-19) with excellent agreement with cardiac magnetic resonance could further improve risk stratification providing a comprehensive characterization of patient disease in term of function and fibrotic cardiac and lung involvement.

Skills that the student should acquire (max. 600 characters including spaces):

The study need to learn out to build a protocol, how to analyse and interpret data, how to write scientific manuscript and divulgate the results. Additionally, how to manage multiomics data and multidisciplinary interaction and collaboration with radiologist, cardiologist, rheumatologist and computer scientist.

References (max. 15)

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- (3) J Family Med Prim Care. 2021 Sep; 10(9): 3330;3335. doi: 10.4103/jfmprc.jfmprc_350_21
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