



screening: 1) the radiation exposure of current LDCT screening programs; 2) the low yield of LDCT in lung nodules characterization, even those classified at higher probabilities of malignancy according to lung-RADS classification and reporting system.

Objectives and specific aims

Specific Aim 1

The first aim is to assess the sensitivity and specificity for the detection of pulmonary nodules of a Single Breath-Hold AI powered no-contrast Lung MRI scan (SBH-Lung-MRI), with a scan time lower than 20 seconds, compared to the respiratory gated UTE (RG-UTE) MRI sequence and to the LDCT scan as the reference standard. Our aim will take full advantage of all the state-of-the-art technologies currently available on modern MRI scanners, including a high magnetic field (3T), ultra high-performance gradient components, high-density and high-performance surface coils, and pushed k-space undersampling in combination with noise reduction AI-based algorithms (Artificial Intelligence Compressed Sensing, AI-CS) to propose a highly fast and highly sensitivity SBH-Lung-MRI sequence.

Specific Aim 2

To investigate the capability of contrast-enhanced PCCT for the characterization and risk stratification of Lung-RADS >3 pulmonary nodules in comparison to FDG-PET and histology.

Specific Aim 3

The third specific aim will assess the health impact and cost-effectiveness of implementing a radiation-free MRI-based lung cancer screening program using the SBH-Lung-MRI approach tested in specific aim 1, compared to conventional LDCT screening.

Expected outcomes

The study is expected to fulfil the knowledge gap in lung nodules non-invasive characterization developing new, safe and cost-effective strategies.

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

The student need to learn how to enrol patient, manage data collection also using electronic CRF, developing imaging protocols based on MRI and PCCT, develop new image analysis



method and be able to interpret the results. The student need to learn our to disseminate data to scientific community and to publish scientific manuscript about the study.

References (max. 15)

1. 10.1056/NEJMod1102873; 10.1056/NEJMod1911793A
2. 10.1136/bmj-2021-069008
3. 10.1016/j.chest.2023.10.028
4. 10.1378/chest.13-1420
5. 10.1148/radiol.211254)
6. 10.5152/dir.2022.201091; 10.3390/jcm9082514