

Applications of Perfusion MRI in Radiation Therapy of Lung Cancers

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Purpose

The aim of this poster is to review and discuss clinical applications of perfusion MRI in radiation therapy for treating lung cancers. There is an urgent need in radiation therapy to incorporate information provided by functional imaging, such as perfusion MRI, together with the anatomical information to improve patient care in treating cancers. Perfusion MRI of the lungs provide important information of pulmonary functionality that can be used to optimize the radiation treatment planning based on lung function, to monitor tumor perfusion changes during and following radiation treatment, to evaluate radiation induced lung injury, and to predict radiation treatment outcomes.

Outline of Content

1. Introduction of lung cancer
 - 1.1 Facts
 - 1.2 Physiology
 - 1.3 Treatment options
2. Introduction of radiation therapy for lung cancers
 - 2.1 Conventional 3D conformal technique
 - 2.2 Intensity-modulated radiotherapy (IMRT) technique
 - 2.3 Stereotactic-body radiotherapy (SBRT) technique
3. Introduction of perfusion MRI technique
 - 3.1 Dynamic contrast-enhanced perfusion MRI
 - 3.2 Non-contrast enhanced arterial spin-labeled perfusion MRI
4. Review of perfusion MRI studies on radiation induced lung injury following conventional treatments of lung cancer patients
5. Review of perfusion MRI studies on radiation induced lung injury following SBRT treatments of lung cancer patients
6. Review of perfusion MRI studies on radiation induced lung injury in small animal models
7. Discussion of perfusion MRI for function-based treatment planning
8. Discussion of perfusion MRI for adaptive SBRT treatment of lung cancer
9. Discussion of the future development of perfusion MRI for radiation therapy
 - 9.1 3D perfusion MRI technique
 - 9.2 Perfusion/ventilation mapping

Summary

Perfusion MRI of the lungs has been intensively investigated in the field of radiology in the past decade. Its application in radiation therapy, however, has been largely limited. There is a great potential of utilizing information provided by perfusion MRI in radiation therapy to improve treatment outcome of lung cancer. Substantial efforts are still needed in translating this technique into clinical applications in radiation therapy. This poster provides a comprehensive review of all aspects of this particular application, including different radiation therapy techniques in treating lung cancers, different perfusion MRI techniques, recent clinical findings, and latest technical developments. Relevant future research directions will also be discussed.