Technique for Respiratory Gated Radiotherapy using Low Frame Rate MRI and a Breathing Motion Model

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SUMMARY

UCLA researchers in the Department of Radiation Oncology have developed a novel method to gate radiotherapy using low frame rate MRI sequences to reduce damage to adjacent tissues during radiotherapy.

BACKGROUND

Taking respiratory movements into account during radiotherapy has always been a major concern in radiotherapy treatments that are affected by lung movement (e.g. thoracic or abdominal cancer). Currently, a common method for gating radiotherapy to prevent healthy tissue damage is by using MRI sequences. While MRI can provide better visualization of the tumor, some MRI sequences (e.g. T2 weighted sequences) are too slow to account correctly for the human breathing cycle. A method to improve the accuracy of MRI-guided radiotherapy would greatly improve radiotherapy.

INNOVATION

Researchers at UCLA have developed a novel method to use low frame rate MRI sequences for radiotherapy gating. The technology enables accurate modeling of patient-specific respiratory motion from continuously acquired MRI images. The method is able to predict respiratory motions with high accuracy, enabling correct gating of radiotherapy for a more precise and safer treatment.

APPLICATIONS

- MRI–guided radiotherapy
- Assessment of tumor response to therapy over time

ADVANTAGES

- Can improve accuracy of MRI-guided radiotherapy
- Can be used to assess tumor response to therapy during treatment
- Can collect functional images during gated treatment

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,617,903	04/04/2023	2017-839
Germany	Published Application	3661424	06/10/2020	2017-839
European Patent Office	Published Application	3661424	06/10/2020	2017-839
France	Published Application	3661424	06/10/2020	2017-839
United Kingdom	Published Application	3661424	06/10/2020	2017-839

RELATED MATERIALS

- Ginn, John S., et al. "Characterization of spatial distortion in a 0.35 T MRI-guided radiotherapy system." Physics in Medicine and Biology 62.11 (2017): 4525.
- Lamb, James M., et al. "Dosimetric validation of a magnetic resonance image gated radiotherapy system using a motion phantom and radiochromic film." Journal of Applied Clinical Medical Physics 18.3 (2017): 163-169.

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INVENTORS

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OTHER INFORMATION

KEYWORDS

Radiotherapy, Magnetic resonance imaging, MRI, Gate radiotherapy, Breathing motion model, Respiratory model, Tumor visualization

CATEGORIZED AS

- **Imaging**
  - Medical
- **Medical**
  - Devices
  - Disease: Cancer
  - Disease: Respiratory and Pulmonary System
  - Imaging
- **Research Tools**
  - Other

RELATED CASES

2017-839-0

▶ Chow, Phillip E., et al. "Dosimetric effects of couch position variability on treatment plan quality with an MRI-guided Co-60 radiation therapy machine." Medical physics 43.8 (2016): 4514-4519.

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