

# REAL-TIME 3D MRI FOR USE IN DIAGNOSTIC MRI AND MRI-GUIDED RADIOTHERAPY

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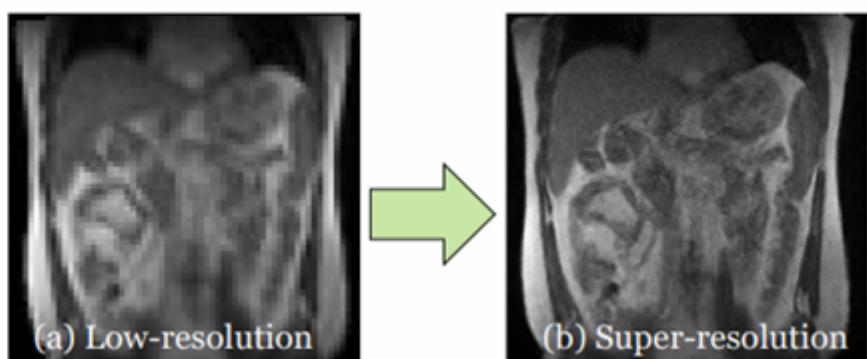
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**Value Proposition:** Method combines two previously known techniques to enable real time 3D MRI image reconstruction for improving patient care.

## Technology Description

Researchers at Washington University in St. Louis have developed a method for real-time, high-resolution 3D MRI that can be used in diagnostic MRI and MRI-guided radiotherapy (MRgRT). MRgRT combines medical imaging with radiation therapy to provide visualization of a tumor within a patient and enable more precise radiation therapy. Existing MRgRT methods provide real time monitoring, but they have difficulty tracking 3D tumor motion as they do not achieve the desired spatial resolution. This is due to limitations in the amount of time it takes to acquire high-resolution sample data and complete image reconstruction.

To help overcome these limitations, this method combines 3D dynamic keyhole imaging (for high temporal acquisition) with the deep learning-based SR generative (SRG) model (for high spatial-reconstruction) to enable high spatial and temporal resolution 3D MRIs in the presence of motion. Thus, providing a much-needed method to improve real-time 3D MRgRT.



Comparison of Dynamic Keyhole and Super-resolution techniques in 3D imaging.

## Stage of Research

Initial validation studies have shown great promise. The inventors demonstrated that the technique's image quality was similar to the original SR images with full k-space data while achieving large accelerations in acquisition time. Method has been shown on 2 patients.

## Publications

- Kim T, Park JC, Gach HM, Chun J, Mutic S. [Technical Note: Real-time 3D MRI in the presence of motion for MRI-guided radiotherapy: 3D Dynamic keyhole imaging with super-resolution](#). Med Phys. 2019

Oct;46(10):4631-4638. doi: 10.1002/mp.13748. Epub 2019 Aug 27.

## **Applications**

- MRI-guided radiotherapy (MRgRT)
- Diagnostic MRI

## **Key Advantages**

- Method provides high spatial and temporal resolution for real-time 3D MRI
- Overcomes complications due to motion and can acquire real-time MRI in the presence of respiratory motion without substantial motion artifacts
- Potential to improve patient care

## **Patents**

- Provisional patent application has been filed

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