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How Recent Advances in MRI Technology Can Help Patients

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ABSTRACT

Want to remain up to date on the latest advances in MRI technology? Click here to find out how this technology is changing for the better.

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Introduction

The MRI or Magnetic Resonance Imaging is a scanning tool used in the medical industry that enables doctors to develop images of the internal sections of large organisms. The working principle behind MRI machines depends on the interaction of water molecules in the presence of a magnetic field.

The protons in the two hydrogen atoms of the water molecules align with the extremely strong incident magnetic field of the MRI machine. Radio waves are then used to excite the molecules and disturb them. This disturbance causes them to release signals that can be detected by a sensor, effectively letting us map the presence of water molecules throughout one's body, showing internal components in great detail.

Ever since its invention, the technology has gone through many changes that impact its resolution, efficiency, and turnaround time. But, there has always been room for improvement as the technology is quite expensive, making it out of the reach of many individuals. Here's how recent advances in MRI technology can cater to a patients' needs.

Novel Magnetization Techniques

The magnet used in MRI machines is quite powerful, producing 1.5 to 3T of magnetic field strength. Compared to the Earth's magnetic field, it is greater by a factor in the millions. Hence, this magnet makes up most of the price of the machine and results in a costly power demand during operation.

Researchers at the University of York are developing novel ways to magnetize naturally occurring molecules in the human body. The molecules become hyperpolarized without becoming toxic

to the human body, allowing researchers to detect them easily without the need for a powerful magnet in MRI technology.

This innovation in MRI technology has the potential to create machines that are smaller in size and more affordable for hospitals – in turn, allowing imaging technology to become portable and used during complex surgical procedures.



Figure 1.

An image of a white MRI machine inside a white room

Image Acquisition

Software is a huge part of the imaging process in MRI machines. The signals collected from the MRI machines after magnetic disturbances have to be compiled and organized to form a 3D image. This process requires intensive computational power and the aid of software to reduce turnaround time.

Siemens is a big name in MRI technology. The company has recently developed machines that scan multiple layers of the body simultaneously rather than in sequence via its Simultaneous Multi-Slice Technology. This reduces the acquisition time for each image which can then be compiled and organized to show scans quickly, enabling doctors to run tests and diagnose patients at a faster rate.

Pulmonary MRI Scanning

Lung MRI scans have been a bottleneck for the medical community since the inception of MRI technology. Given that lungs are filled with air instead of water molecules, the density of hydrogen atoms is lower and results in scans that are not as detailed. Because of this reason, doctors have to rely on Computed tomography (CT) or positron emitted tomography (PET) scans for imaging. The scans are cheap but rely on harmful radiation and can't be done regularly.

Another big name in imaging technology, Toshiba, has developed a dedicated machine for imaging the lungs. The technology relies on Ultrashort Echo Time (UTE) to increase the resolution of regions in the body where signals become weak. This application is ideal for pulmonary MRI scans allowing doctors to scan in detail pulmonary disabilities, cancers, and tumors.