Simultaneous pH- And Oxygen-Weighted MRI Contrast Using Multi-Echo Chemical Exchange Saturation Transfer Imaging (ME-CEST)

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OTHER INFORMATION
KEYWORDS
Chemical exchange saturation transfer, CEST, magnetic resonance imaging, MRI, brain tumor imaging, traumatic brain injury, pH-weighted, hypoxia

CATEGORIZED AS
- Imaging
- Medical
- Medical
- Diagnostics
- Disease: Cancer
- Imaging
- Research Tools

RELATED CASES
2017-794-0
SUMMARY
UCLA researchers in the Department of Radiological Sciences have developed a magnetic resonance imaging (MRI) technique that simultaneously acquires acidic and hypoxic information often associated with brain tumors and traumatic brain injury (TBI).

BACKGROUND
Magnetic Resonance Imaging (MRI) is the primary imaging modality in brain tumor and traumatic brain injury patients. However, traditional MRI techniques cannot characterize the local aggressiveness and metabolic dysfunction of heterogeneous brain tumors or the brain after traumatic injury, which could be useful for monitoring patient response to treatment with higher accuracy. More specifically, no MRI techniques simultaneously collect pH-weighted and hypoxia-weighted information to assess the acidic and hypoxic regions associated brain tumors or the brain after injury. Thus, there is a commercial need for quantifying molecular information in brain tumors and the brain after injury beyond that given by traditional anatomic MRI.

INNOVATION
UCLA researchers have developed a chemical exchange saturation transfer (CEST) magnetic resonance imaging (MRI) technique for simultaneous acquisition of pH- and hypoxia-weighted image data. This technique acquires both pH-weighted and hypoxia-weighted information using a single MRI sequence, where no other MRI sequence developed to date can acquire both types of information. This allows for identification of acidic and hypoxic regions associated with abnormal metabolism, proliferative tumors, and excitotoxicity associated with TBI. This technique can monitor treatment response and determine targets for surgery, radiotherapy, and/or other types of interventions. The MRI sequence can be acquired within a clinically feasible scan time of approximately 7.5 minutes. Furthermore, this sequence provides full brain coverage due to the fast readout, unlike previous CEST applications in which only a small number of slices can be acquired due to slow readout methods. Moreover, this sequence can be implemented on any clinical 3T scanner.

APPLICATIONS
▶ Brain tumor characterization
▶ Traumatic brain injury characterization
▶ Acute stroke characterization

ADVANTAGES
▶ Simultaneous information collected on acidic and hypoxic regions in tumor or injured brain
▶ Short scan time (7.5 minutes)
▶ Full brain coverage (large field of view)
▶ Can be readily implemented into clinical 3T MRI scanners

PATENT STATUS

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RELATED MATERIALS

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS