Improved MRI guided ultrasound therapy using lanthanide coated microbubbles for better image contrast

Technology #m10-110

High intensity focused ultrasound (HIFU) can be used in the therapeutic opening of the blood-brain barrier to enable intranasal or intravenous administration of drugs and gene therapy. While an effective tool, HIFU raises the concern for increased heat damage following prolonged use. This damage can be monitored and minimized via improved contrast magnetic resonance imaging (MRI). Lanthanide coated microbubbles allow for image guided HIFU therapies, increasing efficient and mitigating the risk of exacerbating the disease. Improving the quality of the MRI image will greatly enhance the therapeutic capability of MRI-guided high-intensity focused ultrasound therapies by being able to more precisely target the region of interest in the diseased or damaged tissue, thus reducing the negative side effect of thermal heat buildup.

Better contrast MRI images will enable more sensitive detection of heat buildup and other negative side effects during MRI-guided ultrasound therapies.

MRI-guided high-intensity focused ultrasound therapies are already in use for the treatment of liver, bone, prostate, and brain diseases. These coated microbubbles can be administered to interact with the magnetic field of the MRI to improve the quality of the image. Coated microbubbles can be generated to precisely control for microbubble size and reactivity. The contrast of the MRI signal can be improved by the controlled destruction of the microbubbles by an external acoustic force. MRI-guided ultrasound therapies rely on sharp MRI images to guide the high-intensity ultrasound into the region of disease.

Various sizes of microbubbles were isolated and produced en masse and shown to sharply increase the positive contrast of MRI images.

Lead Inventor:

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**Applications:**

- Higher contrast MRI images for medical use
- Improved MRI-guided ultrasound therapies
- Non-invasive opening of the blood-brain barrier for efficient drug delivery

**Advantages:**

- Non-invasive technique to improve MRI and ultrasound imaging
- Able to inexpensively mass produce microbubbles for therapeutic use
- Mitigates negative side effects of MRI-guided high-intensity ultrasound therapies

**Patent Information:**


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**Related Publications:**


**Inventors**

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