Improved MRI Coil Design for a Breast Biopsy Device

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a device for performing enhanced breast biopsies.

Overview

X-ray mammography is currently the most popular method of detecting breast cancer. However, X-ray mammography requires painful breast compression and is not sensitive enough to detect some early-stage lesions.

Magnetic resonance imaging (MRI) scans provide an alternative method for examining patients at high risk of developing breast cancer. MRI is more sensitive, less painful and capable of detecting lesions at an earlier stage than X-ray mammography. However, conventional MR breast coils use a saddle design that is built into the frame of the device. This design limits rotational motion and access to the breast, which can reduce the usefulness of images.

Furthermore, for an MRI system to provide high-quality images, it is desirable for both the magnetic field transmitter and receiver to be located very close to the breast. But conventional coils are stationary and only capable of receiving magnetic resonance signals, making them poorly suited for bilateral acquisition and high field MRI applications that can produce more valuable images.

Changes to the breast coils are needed before MRI scans can be used routinely to detect breast cancer in high risk patients. One way to improve MR breast coils is to use a symmetrically shaped coil that is tapered with the natural contour of the breast and capable of both transmitting and receiving MR signals.

The Invention

UW Madison researchers have developed a new and improved MR breast coil that may be placed within a 3D stereotactic device to capture lateral and medial images for breast cancer diagnosis. This breast coil uses a symmetrical design, resembling a breast shape, to improve imaging sensitivity.

The new coil design allows different coil sizes to be interchanged on a breast cup to accommodate various breast sizes. These breast cups may be placed in breast cup holders that are built into a frame upon which a patient lies face down. Due to the coil's ability to transmit and receive MR signals, it can be rotated bi-directionally in a complete circle within the table without sacrificing image quality. This is important since the coil can be rotated to optimize the location for needle/probe insertion for biopsy procedures.

To accommodate the competing needs for high signal-to-noise performance of the breast imaging coil and open access to the breast tissue for a biopsy, the new breast coil was incorporated as an integral part of the interventional device. Windows in the coil allow access to the breast tissue for biopsy or therapy probes. The windows can be placed over any portion of the tissue by simply rotating the coil. This new device provides a high degree of flexibility to optimally access the breast for diagnosis and/or therapy.

Given the rotational symmetry, natural breast shape and ease of interchange to accommodate breast size, the coil is a very promising design for an MRI guided biopsy application.

Applications

- Breast biopsies

Key Benefits

- Detects lesions at an early stage
- Well suited for fast bilateral imaging of the breasts.
- Improved safety for fast MRI at higher field strengths (>1.5 T)
- More comfortable than mammograms
- Allows medial and lateral imaging of breast
- Sensitive in regions close to the chest wall
- Number of loops in solenoid may vary to accommodate different breast sizes.
- Patient lies on a custom table that fits coils of different sizes.

Additional Information

For More Information About the Inventors

- Sean Fain

Tech Fields

- Medical Imaging : MRI

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846