Fast and accurate imaging of the arthritic finger joint using digital optical tomography

Technology #cu13042

Early detection of rheumatoid arthritis (RA) greatly increases the efficacy of treatment options, allotting the potential to even eliminate all future symptoms. Current diagnosis of disease relies on measured levels of rheumatoid factor, or the concerns of a symptomatic patient. This technology describes a non-invasive imaging technique that may allow for early detection of rheumatoid arthritis and, with slight modification, may also be applied to other diseases which alter the optical density of human tissues. Based on the amount of light passed through a tissue, this technology can separate true joint data from background noise and reconstruct a 3-dimensional tomographic image of the tissue. This technology has the further potential to increase image accuracy and enhance spatial resolution beyond just finger joint architecture to allow for rapid disease diagnosis in the clinic.

Non-invasive and optics-based imaging modality for the early diagnosis of rheumatoid arthritis

This technology is allows for the early detection of finger joint arthritis while avoiding often painful, inconvenient blood work and eliminating the need for more harmful imaging modalities that expose the patient to radiation. This rapid and accurate method of detection will target a healthcare need for a relatively simple and non-invasive imaging diagnostic. Further development could potentially allow for application of this technology beyond finger joints to other tissues, such as breasts and feet.

The current embodiment has exhibited sensitivities and specificities to rheumatoid arthritis of over 90%, a number expected to improve with further technology development.

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Applications:

- Imaging of finger joints for the early diagnosis of rheumatoid arthritis and evaluation of interventions thereafter.
- Diagnosis of rheumatoid arthritis, an inflammatory disease commonly discovered only in symptomatic patients
• Improved visualization and assessment of tissues (i.e. breasts, brain, cartilage) with a rapid and non-invasive modality.
• Real time monitoring and validation of pharmaceutical compounds during animal testing.

Advantages:
• Improves the arrangement of illumination points to maximize data, reduce acquisition duration, and enhance spatial resolution.
• Could be used in complement with existing diagnostic tools to improve accuracy of patient diagnosis.
• Allows for non-invasive visualization of the finger joint, and may be expanded to other tissues (e.g., breasts, cartilage, brain, feet, etc.).

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Related Publications:

Further Information: Columbia | Technology Ventures Email: TechTransfer@columbia.edu

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