Multispectral Photoacoustic Method for the Early Detection and Diagnosis of Osteoporosis Disease (Ramot)

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Technology

A novel multispectral Photo-Acoustic (PA) method for early detection, diagnosis and treatment monitoring of osteoporosis with high accuracy. The method utilizes a laser source followed by an Acousto-Optic Modulator to optically excite US waves which propagate along the bone axis. Distal measurements of the US wave allow deducing: a) bone functionality from the bone absorption spectrum and b) bone resistance to fracture from the characteristics of the US propagation.

The Need

Osteoporosis is extremely widespread: more than 1 in 3 women and 1 in 5 men will sustain at least one osteoporotic fracture in their lifetimes. It is a major public health problem worldwide due to the number of fractures and the overwhelming related healthcare costs. Currently, the Dual-energy X-ray Absorptiometry (DXA) method, which measures the BMD, is the clinically accepted screening tool. However, DXA is inefficient for detecting bone loss at women younger than 60, it is costly (~200$ per test) and involves ionizing radiation which causes patients non-compliance to the test. Bone loss already begins by the age of 30 but it is too small to be detected by DXA and it is extremely difficult to revert after osteoporosis has developed. Thus, there is a need for non-invasive, non-ionizing and cost-effective screening tool to detect the disease as early as possible based on its pathological expressions and to monitoring disease progression and treatment.

Advantages

Photoacoustic (PA) imaging is a unique modality which uses pulsed or sinusoidal optical excitation and ultrasonic detection. It is therefore a hybrid modality which enjoys advantages of both the optical and the acoustical realms. The stand-alone device will be much more compact, portable and cheap than DXA systems and will be intended to be used in the clinics as well as in hospitals. As it will be non-ionizing and non-invasive it will allow more frequent testing of patients and will be available to a larger part of the population at risk.

Stage of Development
Theoretical simulations have been run and mammal bones ex vivo have been tested, demonstrating feasibility.

Patents

US provisional patent submitted

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