Evaluation of Small Calcification Indicator in Ultrasonography Using Decorrelation between Adjacent Scan Lines

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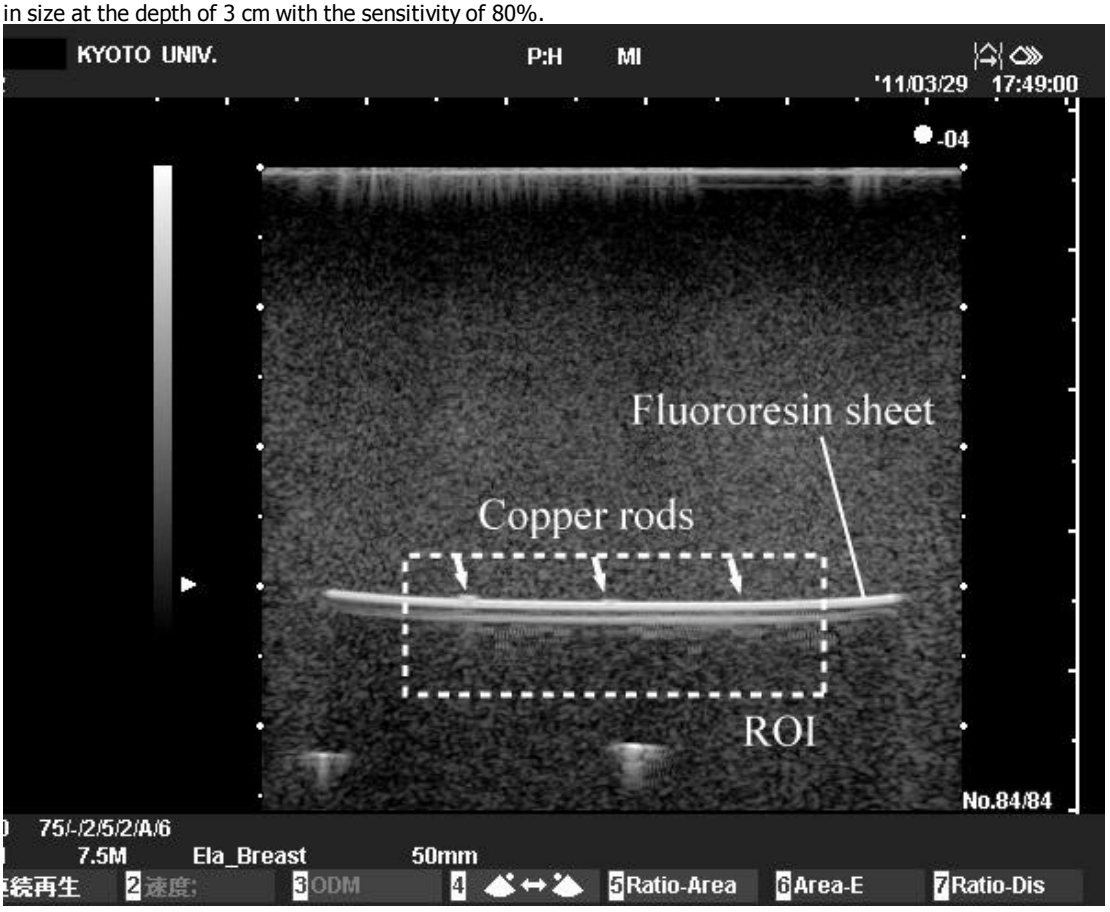
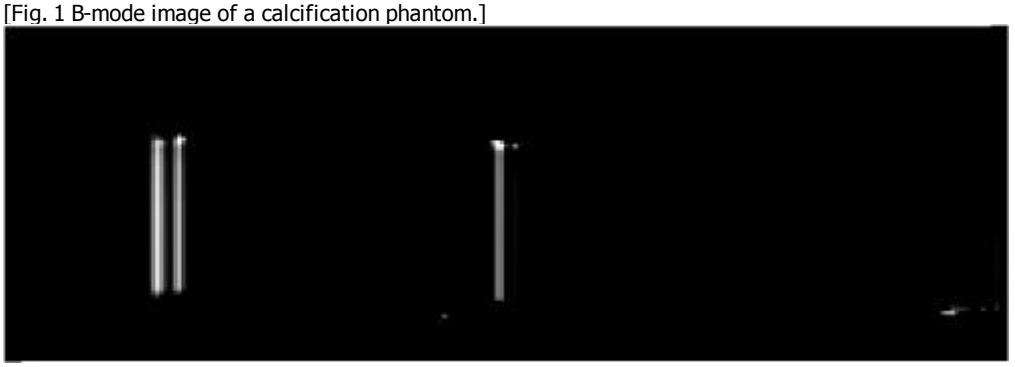
The improvement of calcification detection ability in ultrasonography is supposed to realize a breast cancer screening without X-ray exposure for all people including young women. Since a calcification has a large acoustic impedance mismatch to soft tissue, the echo waveform around a calcification is quite different from that without a calcification. Therefore, we have reported a calcification depiction method using the decrease of correlation between adjacent scan lines, where the decrease occurs by the waveform change of an ultrasound pulse around a calcification. Here, we verify the performance of the proposed calcification indicator using minute copper rods. Figure 1 shows a B-mode image of a calcification phantom with three rods, where both the diameter and length of the rods are 0.3, 0.2, and 0.1 mm in left to right order. Figure 2 shows the calcification indicator, where white areas are the positions with low correlation coefficients between adjacent scan lines. Low correlation areas appear behind the rod positions and extend along the range direction, similar to acoustic shadows. The method succeeded to depict rods 0.2 mm in size at the depth of 3 cm with the sensitivity of 80%.



[Fig. 1 B-mode image of a calcification phantom.]



[Fig. 2 Calcification indicator in the ROI.]