Patch-type capacitive micromachined ultrasound transducer for long term quantitative ultrasound monitoring.

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At the current stage of clinical research, quantitative ultrasound is emerging as a novel approach for noninvasive diagnosis with the potential to substitute the invasive biopsy protocol. As the characteristics of the scattered acoustic signals directly impact the quality of the acquired quantitative images, the development of ultrasound transducers with high performance is essential in ultrasound medical imaging systems. In comparison to the conventional piezoelectric ultrasound transducer, the capacitive micromachined ultrasonic transducer (CMUT) offers competitive advantages such as high receive sensitivity and broader bandwidth which typically exceeds 100%. In addition, because of the micromachining technology, it is possible to develop thin and lightweight transducers in patch type for an extended, long-term monitoring application. In this work, we present a patch-type CMUT transducer designed for continuous ultrasound imaging. The performance of the CMUT patch including Tx sensitivity, Rx sensitivity, and impulse response is presented. Electrical characteristics of the CMUT patch was also evaluated to confirm the stability of the patch. Furthermore, we acquired ultrasound images of a standard phantom to obtain data on the point spread function. In vivo imaging was also conducted on wild-type C57BL/6J mice. Lastly, we investigated the long-term stability of the CMUT patch over a period of 7 days. Through this research, further possibilities of the continuous functional monitoring of disease were investigated.