Methods and devices for ultrasound scanning

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In patients who are obese or exhibit signs of pulmonary disease, standard transthoracic scanning may yield poor quality cardiac images. For these conditions, two-dimensional transesophageal echocardiography (TEE) is established as an essential diagnostic tool. Current techniques in transesophageal scanning, though, are limited by incomplete visualization of cardiac structures in close proximity to the transducer. Thus, a new method and system which propose a 2D curvilinear array for 3D transesophageal echocardiography in order to widen the field of view and increase visualization close to the transducer face. In this project, a 440 channel 5 MHz two-dimensional array with a 12.6 mm aperture diameter on a flexible interconnect circuit has been molded to a 4 mm radius of curvature. A 75% element yield was achieved during fabrication and an average −6dB bandwidth of 30% was observed in pulse-echo tests. Using this transducer in conjunction with modifications to the beam former delay software and scan converter display software of the 3D scanner, cylindrical real-time curvilinear volumetric scans of tissue phantoms was obtained, including a field of view of greater than 120° in the curved, azimuth direction and 65° phased array sector scans in the elevation direction. These images were achieved using a stepped subaperture across the cylindrical curvilinear direction of the transducer face and phased array sector scanning in the noncurved plane. In addition, real-time volume rendered images of a tissue mimicking phantom with holes ranging from 1 cm to less than 4 mm have been obtained. 3D color flow Doppler results have also been acquired. This configuration can theoretically achieve volumes displaying 180° by 120.° The transducer is also capable of obtaining images through a curvilinear stepped subaperture in azimuth in conjunction with a rectilinear stepped subaperture in elevation, further increasing the field of view close to the transducer face.