

A three-dimensional ultrasound-guided biopsy apparatus (3D USBA) has been developed to supplement stereotactic mammography with near-real time 3D and real-time 2D ultrasound imaging. Features from stereotactic mammography-guided biopsy and free-hand ultrasound-guided biopsy have been combined with 3D ultrasound imaging. A custom-built 3D ultrasound acquisition system was coupled with a windowed compression plate and a needle guide. The needle guide is moved into position for accurate targeting of a point identified in a 3D ultrasound image. The guide also ensures that the needle remains in-plane with the 2D ultrasound image for real-time guidance to the target. Biopsy accuracy was assessed for the 3D USBA using biopsy phantoms. The 3D USBA was shown to be successful in targeting lesions as small as 3.2 mm in breast phantoms, with a 96% success rate. Its performance was then compared with that of expert radiologists, who used a clinically standard technique to perform biopsies of the breast phantoms. This comparison has shown equivalence between the 3D USBA and free-hand biopsy, for 3.2 mm lesions *in vitro*, with a 95% confidence. The apparatus has been mounted onto a standard mammography table, so that stereotactic image pairs may be acquired of the same area acquired in the 3D ultrasound image. This allows for real-time guidance of a needle into a target originally identified with mammography. Results of registration between the two imaging modalities will be presented.