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(POS-58) Needle Tip Identification in Clinical Power Doppler Ultrasound Using Induced Vibrations by an Innovative Mechanical Oscillator

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Brachytherapy is a type of cancer treatment that uses inserted needles that act as antennas to deliver radiation to the diseased tissue. A prototype medical device has been developed and built at Western University to provide an innovative technique to guide needle applicators in clinical ultrasound images. The device consists of a micromotor, battery, and contact shaft. The current standard of care is to use ultrasound to track the needle trajectory. Two-dimensional ultrasound is very limited in its ability to visualize the needle tip location due to image contrast, and the inherent flat nature. One method to help visualize the needle tip is through power Doppler (PD) ultrasound. Low amplitude vibrations produced along the needle, will show up on a power Doppler ultrasound, which greatly assists in locating the tip position. A transrectal 14 –4 MHz ultrasound probe by BK Medical was used to collect image data on a tissue equivalent phantom. The needles were inserted in the phantom in a typical clinical pattern, mimicking the needle tip shadowing effect that makes some needle tips difficult to identify in a standard B-Mode image. Needle tips were identified in the three different setups: B-Mode, B-Mode with PD overlay, and PD without B-Mode. The results demonstrated similar tip error for well visible standard clinical needles, and superior tip error with the use of PD by more than a factor of two. The mean tip error for shadowed needles in B-Mode only images was found to be 0.80±1.70mm, and 0.34±0.47mm for B-Mode with PD enabled.

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