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MRI/TRUS FUSION-GUIDED BIOPSY TECHNIQUE: CHARACTERIZATION OF THE LEARNING CURVE IN PROSTATE PHANTOM MODELS

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Introduction and Objective: MRI/TRUS fusion-guided biopsy (FBx) is a novel technology that is currently being rapidly adopted into clinical practice. However, accurate biopsy results demands acquired skillsets that are developed with time and experience. We aim to define the learning curve for the FBx technique utilizing a software-based fusion biopsy platform.

Methods: 10 users within 5 different experience levels were asked to perform electromagnetically tracked FBx after completion of a standardized didactic and hands-on course. Experience levels included gold standard (>1000 FBx), Expert (50-100 FBx), urology fellows with no FBx experience, radiology residents, and medical students. Prostate phantom models (CIRS Inc.) with 4 gold fiducial targets were segmented on T2 imaging. FBx of each target was performed using rigid registration with the UroNav system (Invivo Corp.) and then with ultrasound (US) only. Mechanical targeting error (MTE) was calculated as distance between the centroid "bullseye" target displayed on the fusion platform and actual core location during FBx; fusion registration error (FRE) was defined as the distance between MR target and transformed core location from the US only biopsy. Time to completion of each task during FBx was recorded.

Results: Data from three completed trials is reported. Averaged among three trials, mean overall time to completion of FBx by the different experience level subgroups ranged from 13:57 minutes in the gold standard group to 33:01 minutes in the medical student group [**Figure 1a**]. Mean MTE remained low among all user levels and ranged from 1.07 mm to 1.53 mm. Average mean FRE, which ranged from 3.81 mm to 6.11 mm, demonstrated a linear relationship with user level (correlation coefficient 0.947, $p = 0.015$) [**Figure 1b**].

Conclusion: Fusion-guided biopsy is a complex multi-step procedure requiring proficiency in spatial reasoning, coordination, and basics of image-guidance to ensure acceptable accuracy. Further characterization of the learning curve by experience level with additional trials will help determine the experience needed to attain a standardized level of proficiency for this technique, prior to employing it in clinical practice.

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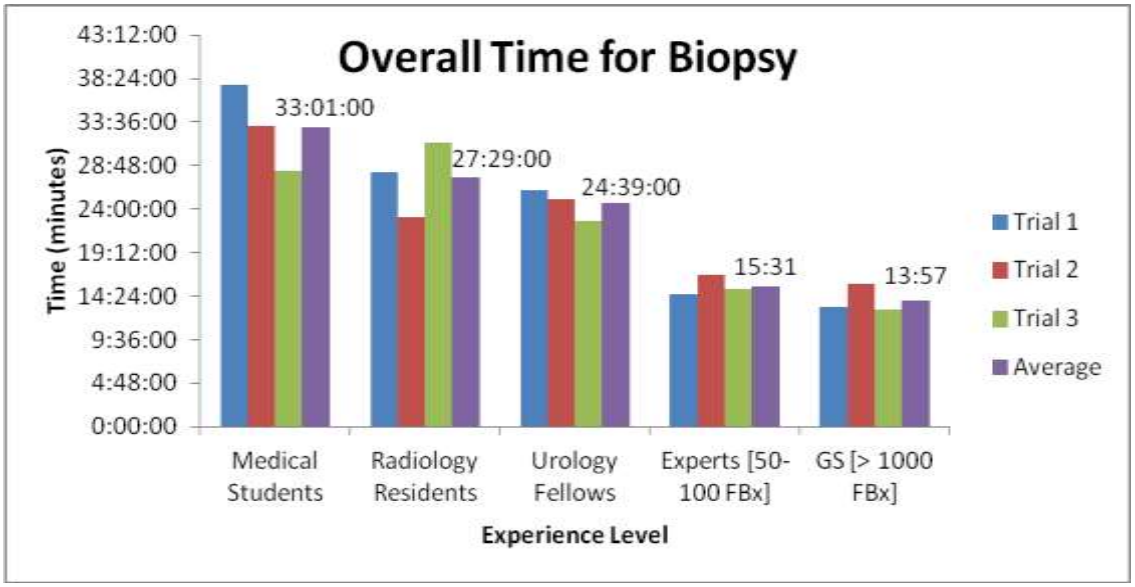

Figure 1a

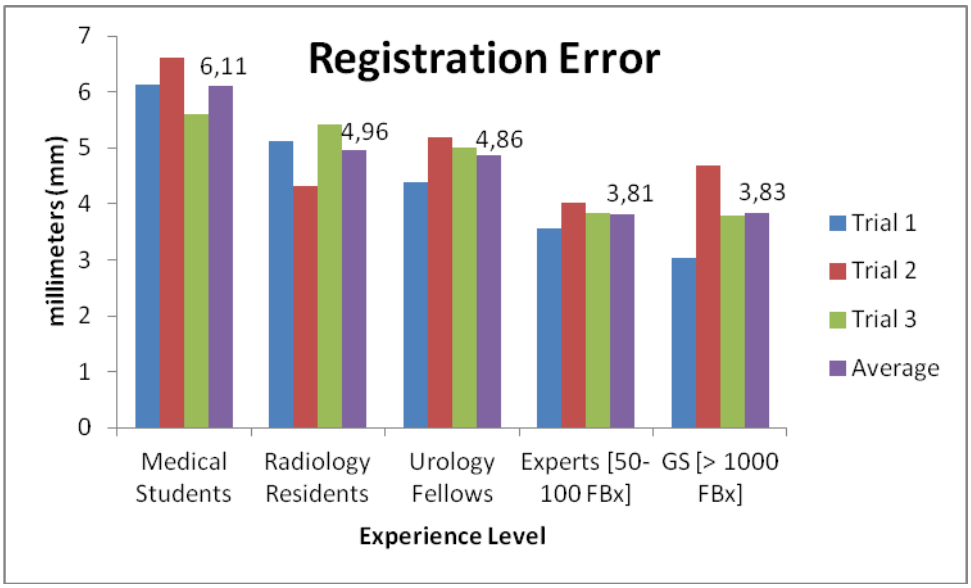

Figure 1b