

Virtual ACS 2021 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

Research In-Progress

False Negative Proportions Increase with Template Deviation During Simulated, Systematic, Side-Fire Prostate Biopsy

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Introduction: During freehand systematic prostate biopsy (sPBx), it is difficult to distribute the cores according to sPBx templates. We call the average of the shortest distance between each core center and its intended template location “template deviation”, a metric of how closely core centers match the template. sPBx false negatives (FN) range from 21-47% in patients. We investigated in a new simulator if sPBx template deviation is related to FN proportion.

Methods: Center B (n=12) and C (n=16) trainees performed simulated 12-core, double-sextant, side-fire, transrectal ultrasound (TRUS) sPBx. Baseline set BI is before training; Tn after ~30 minutes training; Mt best score with continued training with a methodical technique. We placed virtual 4.9 mm radius spherical lesions, invisible with TRUS, at the right and left medial apex of a simulated 24.4 ml prostate. Unless a core and a lesion intersect, however slightly, a FN occurs. We calculated FN proportion (# of false negatives/# of sPBx 12-core sets) for each center at conditions BI, Tn and Mt.

Preliminary Results: For both lesions, template deviation and FN proportion in both centers are related ($p = 0.0015$). The fitted model: $Odds\ of\ false\ negatives = \exp(-2.84 + 0.22 \times TemplateDeviation)$. On average, the odds of FN increases by 25% (95%CI: 8.9%-43.4%) with each 1 mm increase in template deviation, not differing significantly between centers or lesions. All 12 center B trainees completed competency-based training (competency = template deviation ≤ 5 mm). Only 12/16 C trainees came back for further training to reach competency (≤ 5 mm), explaining the C Mt deviation >5 mm.

Next Steps: We will explore further the relationship between template deviation and FN proportions for other lesion locations, shapes and sizes, different prostate shapes and sizes for side-fire, end-fire and transperineal sPBx. We have applied for research funds to translate our findings to reduction of sPBx FN in *patients*.

