Superiority & Efficacy of a Cadaver vs Breast Phantom Model for Teaching Ultrasound-Guided Breast Biopsy & Wire Localization to Surgical Trainees

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BACKGROUND

- Ultrasound (US) is successfully used in breast oncology for lesion characterization, biopsies, tumor localization, and intraoperative excision
- In academic breast surgery, ultrasound-guided breast procedures (UGBPs) tend to be isolated to radiology departments, thus formal surgical resident breast US training is sparse
- Thus, we developed a novel curriculum to teach UGBPs using cadavers and phantom models

METHODS

- Residents received a one-hour lecture on US-guided breast core needle biopsies (CNB) and wire localization (WL) followed by a one-hour hands-on laboratory session
- Red pimento stuffed olives implanted in chicken breasts (phantom) and breasts of lightly embalmed female cadavers were used to replicate breast masses (see Figure 1)
- Anonymous pre- and post-laboratory surveys were completed by residents and analyzed using a two-sample t-test, Wilcoxon rank sum test, and ordered logit
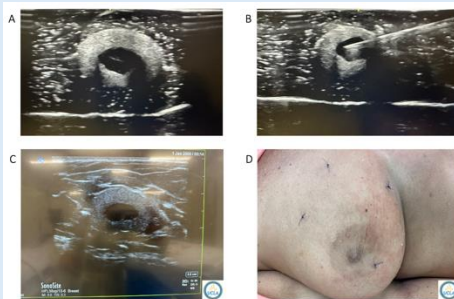

Figure 1. Ultrasound images of olive in chicken breast (A) and undergoing wire localization (B). Ultrasound image of olive in cadaver breast (C). Cadaver breast after implantation of olives (D).

RESULTS

- 2 separate sessions were conducted
- 34 trainees participated in the didactic session and completed the pre-laboratory survey, of which 26 completed the post-laboratory survey
- Clinical year ranged from 2 to 6 (median 3)
- Most trainees (n=23, 67.6%) had previous faculty-led US teaching and had independently performed ≥6 US-guided procedures (n=23, 67.6%)
- 71% (24/34) of residents had never performed UGBPs
- Following the course, residents' confidence in describing and performing CNBs and WLs on pre- and post-laboratory surveys increased significantly, even when controlling for clinical year (p< 0.001, see Figure 2)

Figure 2. Pre- and post-laboratory UGBP responses.
*Wilcoxon rank sum test p<0.001 for statements 1-4.
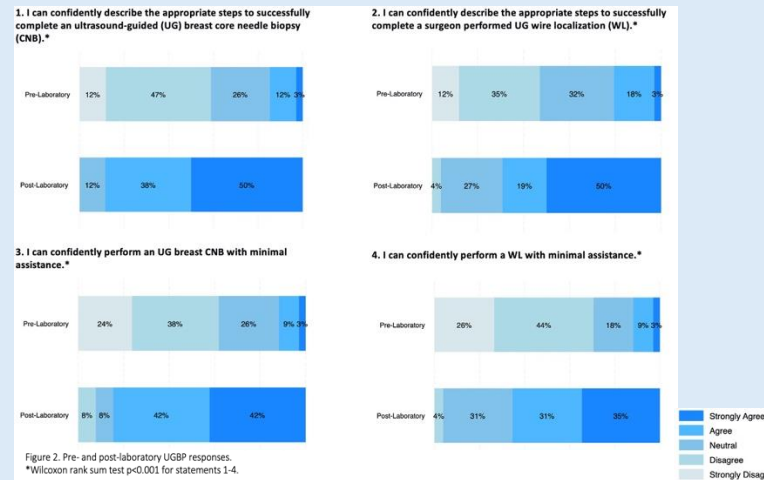
Survey Question	Post-Laboratory Survey
	26
Successfully biopsied and confirmed sampling of the red pimento from the olive*, N (%)	**20* (100.0%)**
Successful ultrasound-guided wire localization*=, N (%)	14/19 (73.7%)
Preferred model†, N (%)	
Cadaver	21 (80.7%)
Phantom	1 (3.8%)
Both	3 (11.5%)
Reasons for preferring cadaverᐃ	
More realistic	12
Better US imaging	4
Chicken poorer model	3
No time to switch	1
Unanswered	7
What is your overall experience of this course? N (%)	
Fair	1 (3.8%)
Good	7 (26.9%)
Excellent	18 (69.2%)
Do you think the knowledge and skills you acquired during the course prepare you for real-life operations? N (%)	
Yes	20 (76.9%)
Maybe	6 (23.1%)

Table 1. Post-laboratory survey responses.
*Only captured in first session survey. =One participant unable to attempt wire localization. †One response unrelated, thus excluded. ᐃMultiple answers possible; answers categorized.

CONCLUSIONS

- After a novel two-hour UGBP training curriculum using phantom and cadaveric models, participant confidence in describing and performing UGBPs significantly improved
- The cadaveric model was preferred for learning UGBPs
- Further studies are needed to investigate transferability of these skills to clinical practice

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