Short Report

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A Low-cost model of breast biopsy for the training of surgical residents during COVID-19 pandemic

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Abstract

We describe a low-cost simulation model for teaching core needle biopsy to surgical trainees in Low- and Middle-income countries (LMICs). Pre-session and post-session surveys showed that correct core sampling (ability to hit the beetroot) after training was 91.4% compared to 75.7% before demonstration and improved adequacy (68.5% before v. 85.7% after). This low-cost model using locally available products is designed to simulate a palpable breast lump and can easily be incorporated into surgical training in LMICs, where a palpable breast lump is the commonest presentation of breast cancer.

Keywords

surgical education, surgical training, simulation

Resumé

In India, breast cancer has become the most common cancer among women surpassing even cervical cancer.[1] Excluding or diagnosing malignancy in a breast lump is the foremost priority of the treating surgeon and for that, a core needle biopsy is the gold standard.[2] A rate of re-biopsy is 5-15% even in most experienced hands as with any other percutaneous sampling procedure owing to sampling errors (*e.g.* targeting error, poor tissue acquisition) and can result in a false-negative diagnosis, which delays cancer treatment initiation.[3]

Core needle biopsy has previously been taught on patients, as costly simulators are difficult to acquire and sustain.[4] However, the COVID-19 pandemic has disrupted this model of 'live' surgical learning, changing the focus to service rather than learning.[5] With increasing incentives, we created a low-cost model to bridge the gap. This was created using foam as the breast and beetroot as the core (Figure 1). Its cost was negligible. Fourteen first year post-graduate year surgery trainees with varied experience in breast core needle biopsy were asked to perform core needle biopsy on the breast model. Pre- and post-session surveys were conducted to know their previous exposure and post-session satisfaction and confidence (on a Likert scale 1-5, where one indicates unsatisfied and five extremely satisfied). Adequacy of core biopsy was based on the adequate length of beetroot in the core biopsy needle (Figure 2). The correct technique of core biopsy was later demonstrated. Candidates were re-evaluated after demonstration.

The correct core sampling (ability to hit the beetroot) after demonstration was 91.4% compared to 75.7% before demonstration. Adequacy of core biopsy improved after demonstration (85.7% after demonstration v. 68.5% prior). All residents rated this experience as good to excellent. All but one resident felt that the model was realistic and helped in understanding the idea of core biopsy [Table 1].

Earlier models had used turkey breasts,[6] modeling clay[7] and eggplants injected with barium sulphate mixture (cost US$ 20) for stereotactic breast biopsy;[8] all of which are more difficult to work with for many reasons, including concerns about contamination, excessive preparation time and expense.

Our model not only eliminates administrative bottle necks in training programmes, but the response from trainees has been overwhelmingly positive; we thus plan to integrate the beetroot biopsy model into our surgical training programme.

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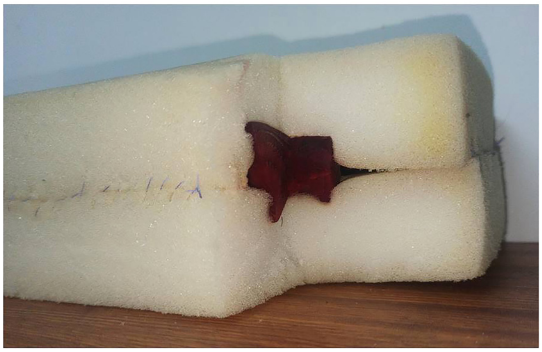

Figure 1. Phantom breast biopsy model made of gel foam.

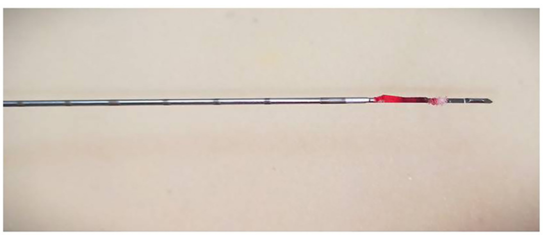

Figure 2. Adequate biopsy demonstrated by column of tissue.

Table 1. Summary of pre and post simulation model session survey results among first year post-graduate surgical resdients (n = 14).

Parameter	Metrics
Experience of Pre-session breast biopsies performed on patients	Median 8 (Range 1-25)
Pre-session biopsy training on a simulation model	0
Pre-session successful biopsy rate (%)	65%
Successful biopsy rate on simulation model on first attempt	75.7%
Successful biopsy rate after demonstration and practice	91.4%
Rating of experience with the model	Good-21.5% (3/ 14) Excellent- 78.5% (11/ 14)
Rating of usefulness in training with increased confidence	100% (14/ 14)

Declarations

Author contributions

SJ – Data collection, literature search, figures
SKY and DS - Literature search, figures, study design, data analysis, data interpretation, writing.
SKY, DS and PA- Revision and editing of manuscript

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Ethics clearance was not obtained as this study did not involve human patients.

This is to declare that all authors have contributed to the study. No part of the manuscript has been sent for consideration elsewhere or published in any International or National journal. The authors clearly certify that there is no aspect of plagiarism. All the conflicts of interest have been clearly defined and the source of grant disclosed. Due ethical permission/ consent has been obtained for carrying out the study. In case of any dispute, the authors will be held fully responsible for the statement disclosed in the cover letter. The authors are also aware of the copyright rules and also declare that they will not reproduce any published text without due permission from the journal

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