Using 3D stereophotogrammetry to evaluate the stability, and positional accuracy of a breast immobilisation device

ROSBOTTOM, Keeley, PROBST, Heidi <http://orcid.org/0000-0003-0035-1946>, CHOPPIN, Simon <http://orcid.org/0000-0003-2111-7710>, BRAGG, Christopher Mark <http://orcid.org/rcid.org/0000-0003-4509-0524>, COLLINS, Karen, CRANK, Helen <http://orcid.org/0000-0001-6086-049X>, REED, Heath <http://orcid.org/0000-0003-2615-3315>, STANTON, Andrew and LANGLEY, Joe <http://orcid.org/0000-0002-9770-8720>

Sheffield Hallam University

http://www.support4all.org.uk

k.rosbottom@shu.ac.uk

Using 3D stereophotogrammetry to evaluate the stability, and positional accuracy of a breast immobilisation device

Keeley Rosbottom, Prof. Heidi Probst, Dr. Simon Choppin, Dr. Chris Bragg, Prof. Karen Collins, Dr. Helen Crank, Heath Read, Andrew Stanton, Joe Langley, Sheffield Hallam University

Background

• Breast cancer is the most frequent cancer among women globally, with an estimated 1.7 million new cases diagnosed in 2012[1].

• Developments in radiotherapy treatment complexity require more accurate breast stabilisation. The rationale supports the evaluation of a novel bra (S4A bra) created by the SuPPORT 4 All study team.

• 3D stereophotogrammetry (3dMD) is a non-invasive system with the potential to evaluate breast positional accuracy within the S4A bra in relation to anatomical landmarks[2] ahead of a clinical feasibility study.

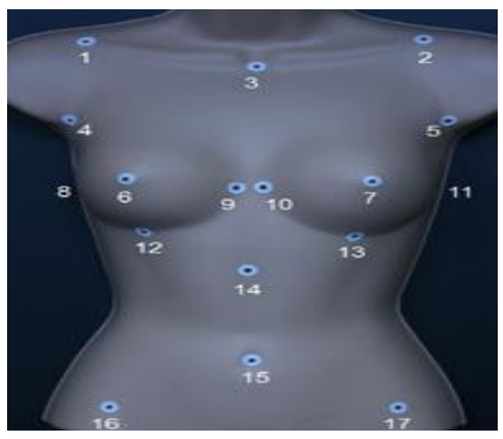

Image 1: Anatomical landmarks used to identify positional movements of breast tissue . In Wheat et al (2014) p734.

Aims & Objectives

1. To assess if 3dMD is a useful tool to establish the capabilities of the S4A bra outside of the clinical setting.

2. To investigate the capability of the S4A bra compared to no bra to accurately reproduce breast shape and position after repeated placement.

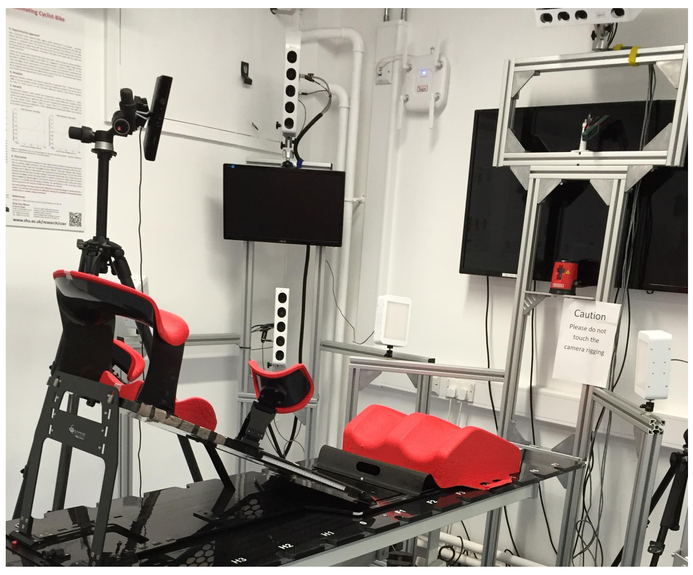

Image 2: 3dMD camera configuration to acquire images: Authors original image.

Methods

Four surface scanning images of a healthy volunteer were taken: 2 of repeated bra fittings when wearing the S4A bra, and 2 when the participant wore no bra. This allowed direct comparisons to be made.

Results

Presented are the results for a single case as an example. Positional movements of breast tissue (measured in mm), and changes in breast shape were assessed. Table 1 shows the differences between breast placement over 2 repeated images without and with the S4A bra.

	Average Distance (AD) in mm	AD +	AD -
No bra	-0.8	3.6	4.1
S4A bra	1.8	5.7	3.7

Table 1: Comparison of deviation from 2 overlaid images

The images show the +/-5mm deviation analysis of 2 repeated images overlaid: green colour wash indicates 3mm deviation. Red shows a +5mm error and blue a -5mm error.

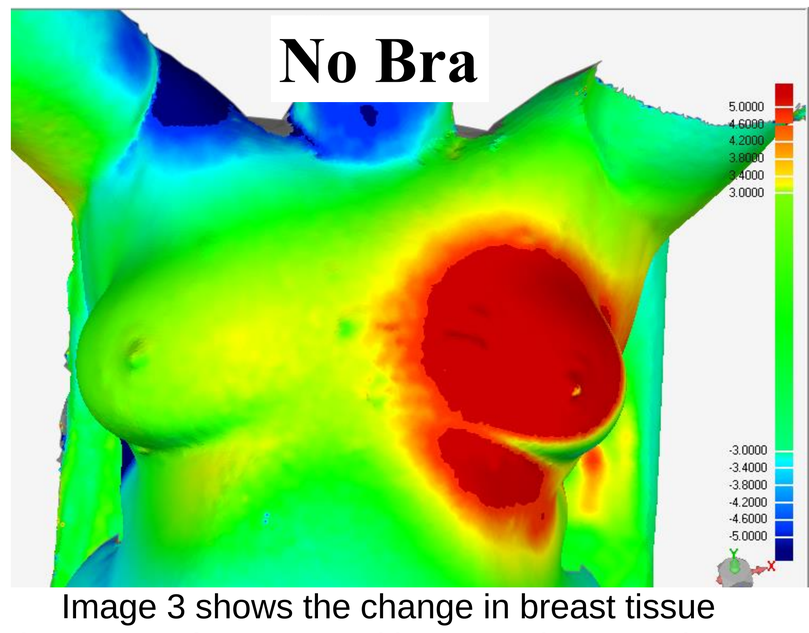

Image 3 shows the change in breast tissue placement after repeated images when wearing no bra.

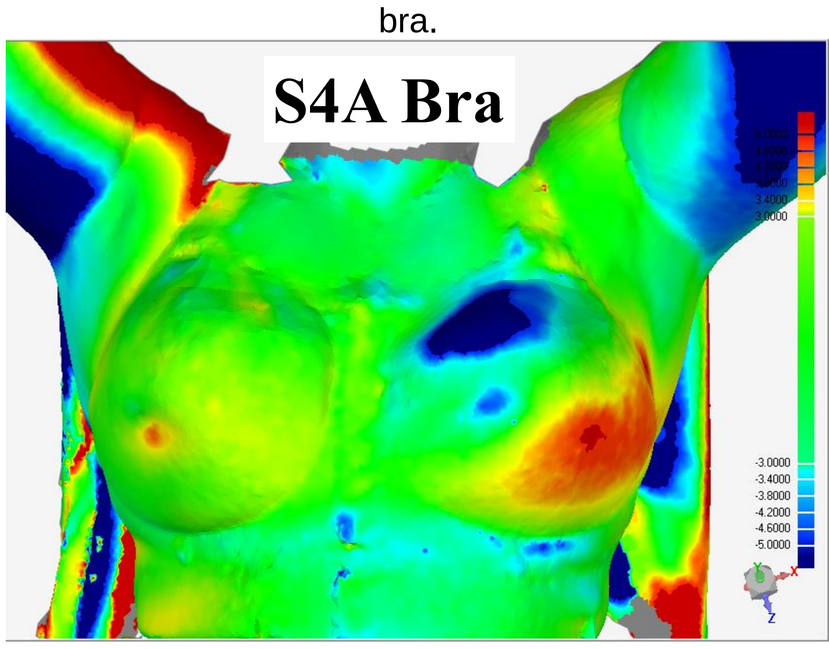

Image 4 shows the change in breast tissue placement after repeated images when wearing the S4A bra.

Further participants will be scanned until a total of twenty cases with repeated images are available for analysis.

Conclusion

Indications are that 3dMD scanning maybe a suitable method for assessing set up accuracy of new immobilisation devices prior to introduction to clinical practice as part of the product development process.

References

1. ttp://globocan.iarc.fr/old/FactSheets/cancers/breast-new.asp last accessed 11/03/16

2. Wheat JS, Choppin S, Goyal A. Development and assessment of a Microsoft Kinect based system for imaging the breast in three dimensions. Medical Engineering & Physics 2014;36:732–7. 38

This work is funded by the National Institute for Health Research (NIHR) Invention for Innovation Programme (programme grant number: II-LA-0214-20001)