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

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Background

- Breast cancer is the most frequent cancer among women globally, with an estimated 1.7 million new cases diagnosed in 2012¹.
- 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 landmarks² ahead of a clinical feasibility study.

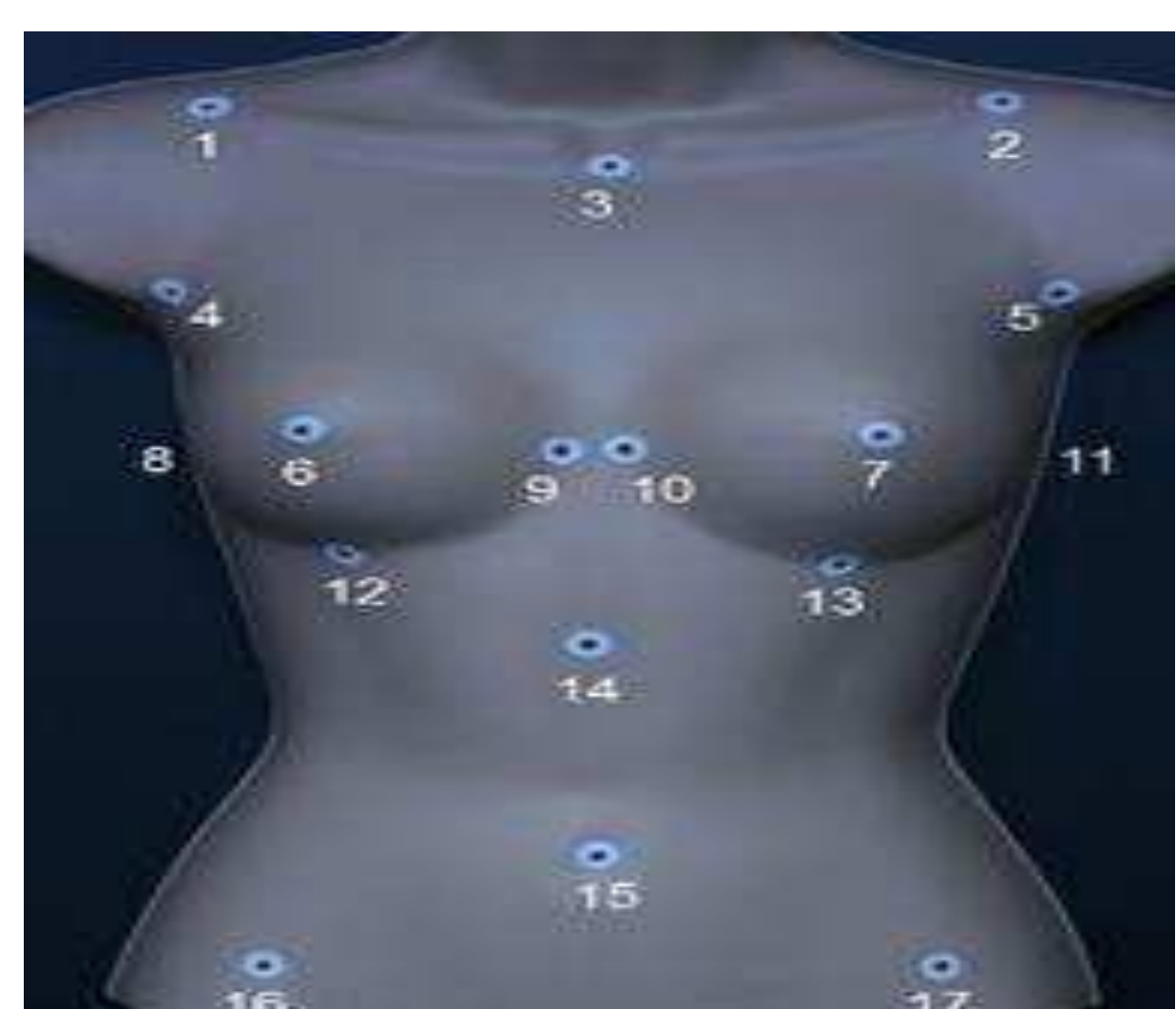


Image 1: Anatomical landmarks used to identify positional movements of breast tissue .
In Wheat et al (2014) p734.

Aims & Objectives

- To assess if 3dMD is a useful tool to establish the capabilities of the S4A bra outside of the clinical setting.
- To investigate the capability of the S4A bra compared to no bra to accurately reproduce breast shape and position after repeated placement.

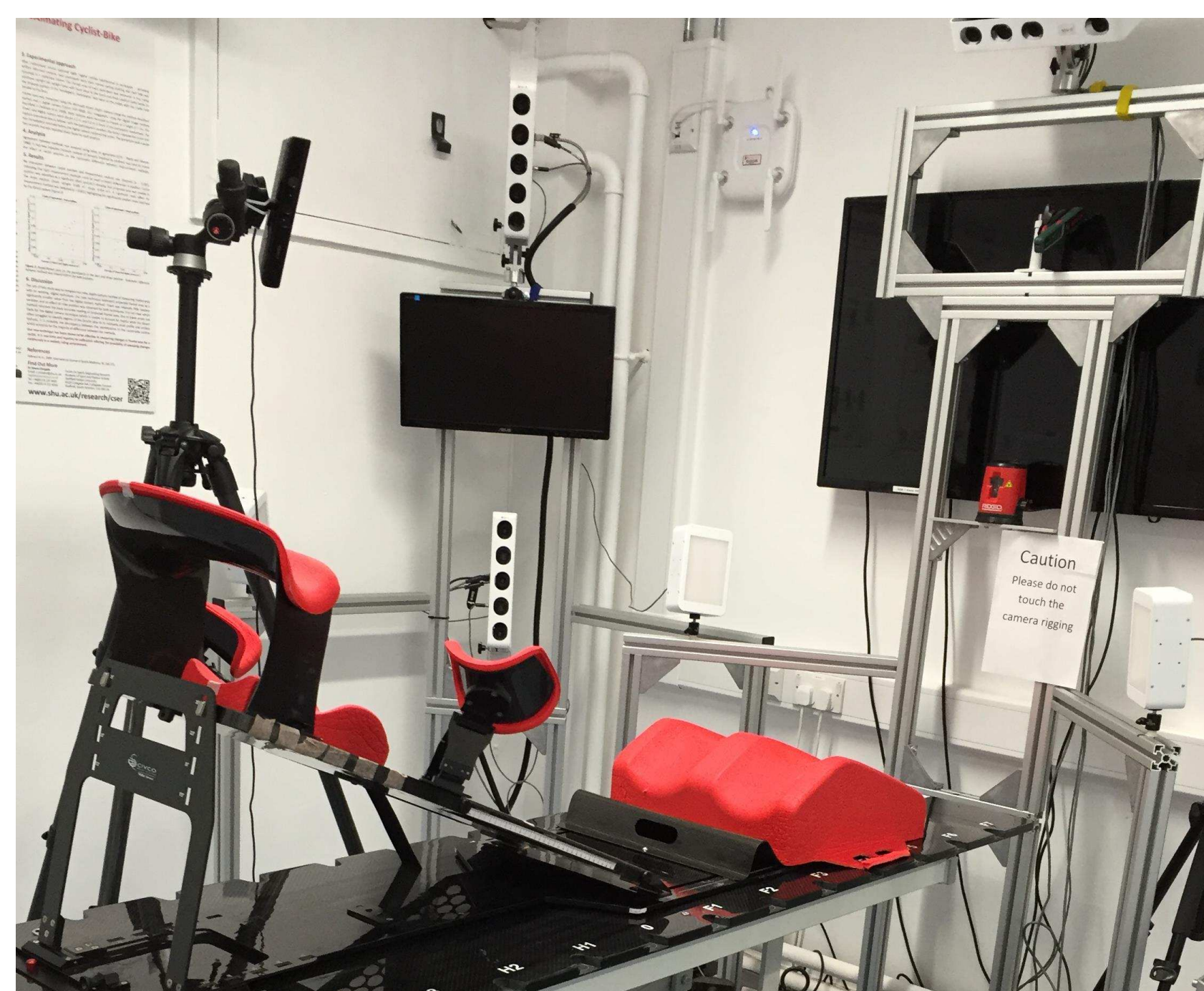


Image 2: 3dMD camera configuration to acquire images: Authors original image.

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.

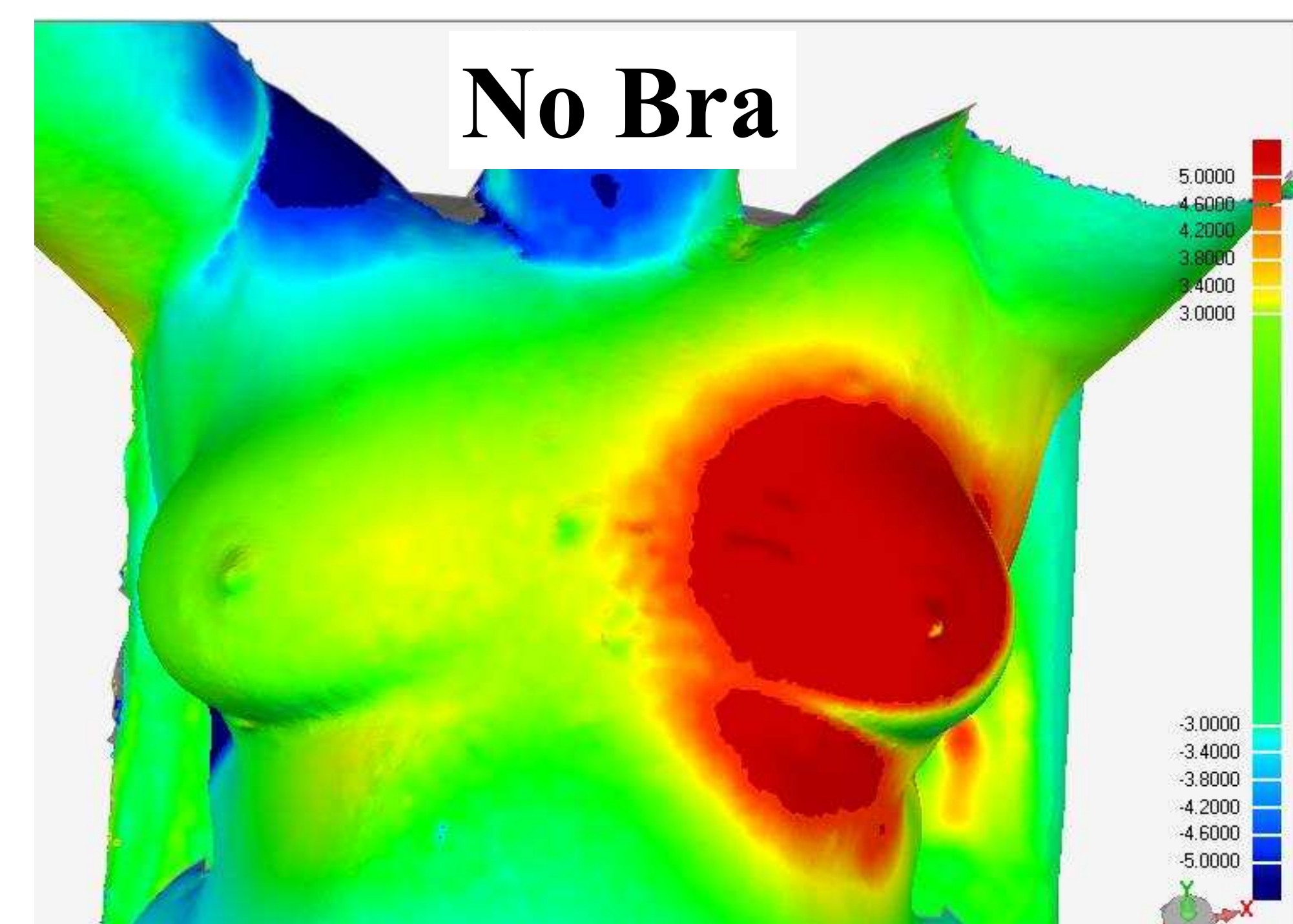


Image 3 shows the change in breast tissue placement after repeated images when wearing no bra.

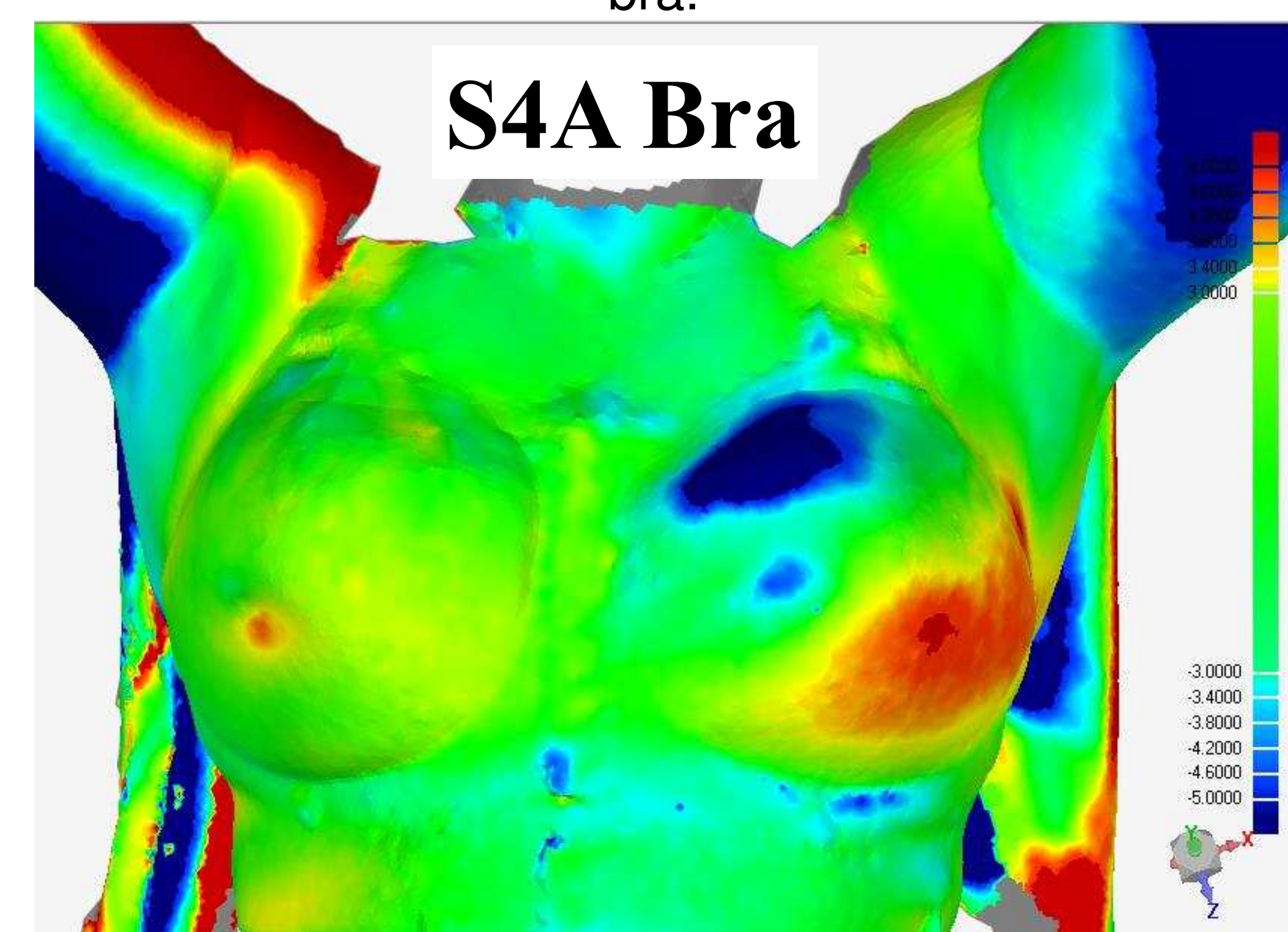


Image 4 shows the change in breast tissue placement after repeated images when wearing the S4A bra.

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

- <http://globocan.iarc.fr/old/FactSheets/cancers/breast-new.asp> last accessed 11/03/16
- 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