AN AUGMENTED REALITY METHOD OF VISUALISING TRANSTIBIAL SOCKET PRESSURES AND LIMB ORIENTATION

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BACKGROUND

The measurement of in-socket pressure distribution has been a research concern for decades. Inappropriate application of pressure to the residuum has been implicated in discomfort, pressure injury, development of skin conditions and subsequent reduction in function [1]. Despite this interest, measurement systems have not moved from research tools into routine practice. One reason suggested for this is difficulty in interpretation: they lack the context of position relative to the measured socket and in associating the results with the orientation of the socket during movement [2]. These aspects may be improved by using an augmented reality system to visualise results by providing a scaled model, displaying measured pressure values and oriented to provide positional context.

AIM

To investigate the potential for using an augmented reality system on a recording of transtibial socket pressure distribution obtained using an inverse-problem measurement system.

METHOD

A representative 3D model of a transtibial socket was created in Solidworks and imported to an augmented reality application (eDrawings iOS) in order to be associated with a positioning barcode. A set of dynamic measurements of in-socket pressures in eight locations during walking was obtained using a neural network-based system (reported in detail elsewhere [3]). The changes in pressure distribution were represented on the socket model by altering the colour of patches on the socket surface, and socket orientation modified to represent different phases of the gait cycle. The finished model was viewed using a smartphone.

RESULTS

Researchers were able to successfully observe changes in 3D position and relative load of different measurement locations on a scaled model of the participant's socket. An example of this is shown in figure 1.

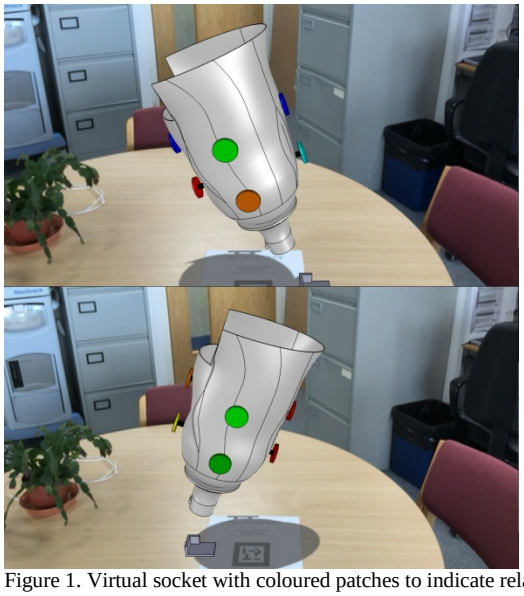

Figure 1. Virtual socket with coloured patches to indicate relative load distribution, and orientated to display early and late stance

DISCUSSION & CONCLUSION

Although it proved possible to visualise relative pressure distribution using this commercial system, it was time-consuming and complex to achieve using this implementation with commercially available software. Validation of the utility of such a presentation system in a clinical setting is also required as part of the development process. A future implementation using a custom program may be a more effective and flexible solution in this particular application.

REFERENCES

[1] Butler et al (2014), *J. Tissue Viability*
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