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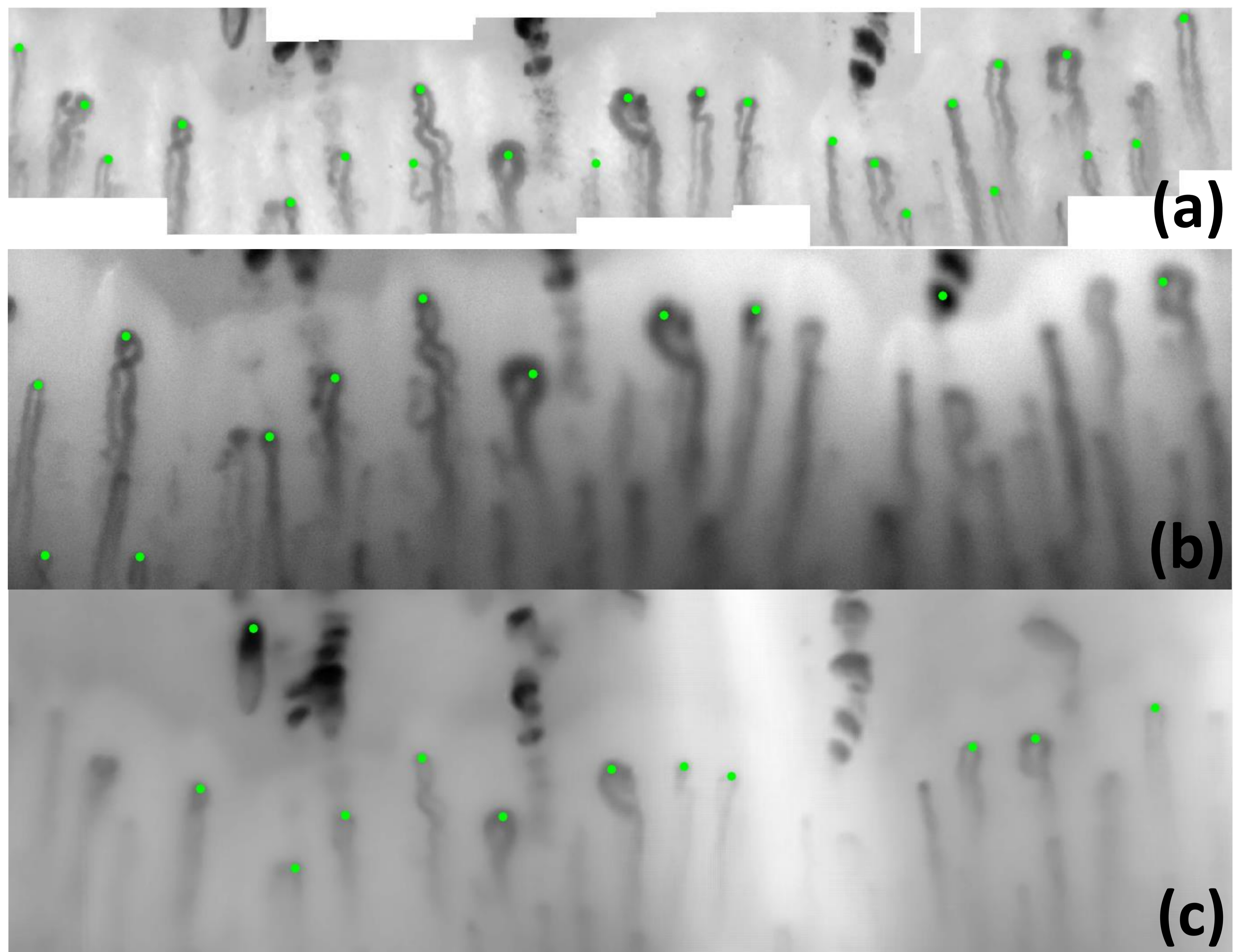
Background and objectives

- Nailfold capillaroscopy allows identification amongst patients presenting with Raynaud's phenomenon of those at high risk of developing systemic sclerosis (SSc): abnormal nailfold capillaries are a key component of the 2013 ACR/EULAR diagnostic criteria for SSc.
- Not all rheumatologists have access to high magnification capillaroscopy.
- Our aim was to demonstrate the feasibility of acquiring and automatically analysing images from low-cost commodity devices (e.g. USB microscope), by comparing areas under ROC curves for two common nailfold metrics (density and mean vessel width) between 3 microscope systems.

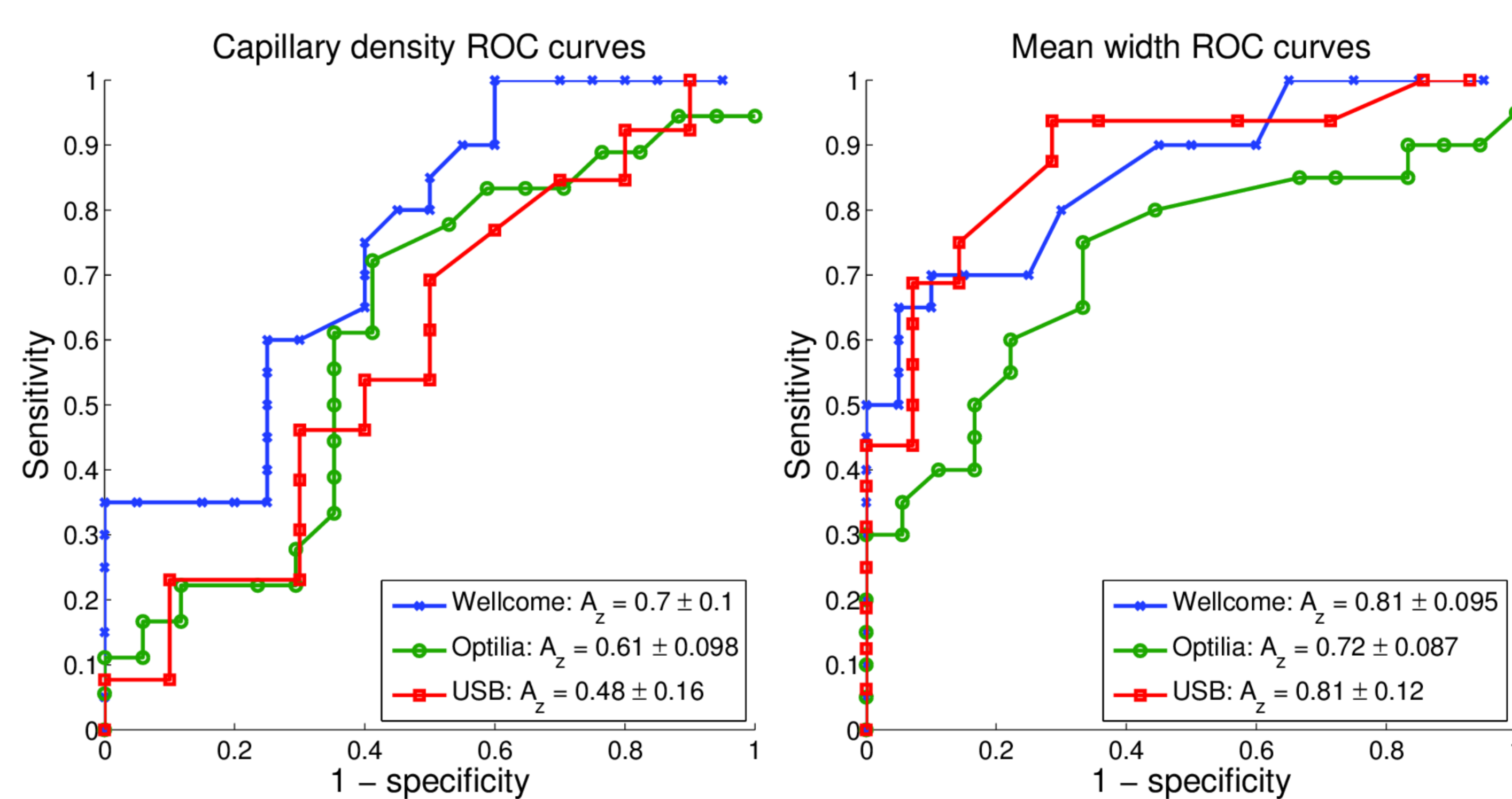
Study design and methods

- Forty participants (20 patients with SSc, 20 healthy controls) were acclimatised in a temperature and humidity-controlled laboratory.
- Participants underwent mosaic imaging of left and right ring finger nailfolds, using 3 microscope systems: (1) high-precision, custom-built, videocapillaroscopy system (Wellcome system, 'gold standard' for comparison purposes), (2) Optilia hand-held device, and (3) low-cost USB microscope (see Figure 1).
- Images automatically analysed using in-house software, developed primarily for analysing images from the 'gold standard' system [1] [Figure 1 (a)].
- ROC curves (Figure 2) allow comparison between imaging systems.

Results



↑Figure 1. Mosaic images of the same nailfold with each of 3 microscope systems: (a) Wellcome 'gold standard' system; (b) Optilia hand-held device; and (c) low-cost USB microscope. Green dots are the automatically detected locations of distal vessels, as determined by software.



←Figure 2. ROC curves for (left) density and (right) mean width for each of 3 systems; based on the ability of the combination to correctly distinguish between nailfolds from controls and those from patients with SSc. Areas (A_2) under the ROC curves allow comparison between systems.

Conclusion

- Morphology measures extracted from all 3 systems can be used to discriminate controls from patients with SSc.
- Measures from all 3 systems predicted SSc significantly better than chance.
- Further work on analysis software optimisation and measure calibration between systems is now required.

Acknowledgements

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