

Portable three-dimensional fundus imaging using an oDocs nun ophthalmoscope, smartphone, photo montage software and a stereo viewer: A proof of concept

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INTRODUCTION

We describe a simple method, requiring little training, of acquiring, assembling and presenting smartphone retinal images for basic stereoscopic viewing.



Figure 1: Left: Examples of types of phone screen stereo viewer available. Right: The oDocs nun fundoscopy device.

METHODOLOGY

Patients in Dunedin Eye Department with three-dimensional fundus pathology were recruited from February to September 2020 following ethical and Dunedin Hospital locality approval from Health Research South (Sep 2019 H19/194). Right and Left fundoscopic image pairs taken by the oDocs nun ophthalmoscope device were then coupled onto a montage app and mounted to camera roll (thanks to RCSEd & Sight Scotland for funding). Stereoscopic viewing of the dichoptic images was enabled through commonly available, low-cost source viewers (e.g. Google Cardboard).

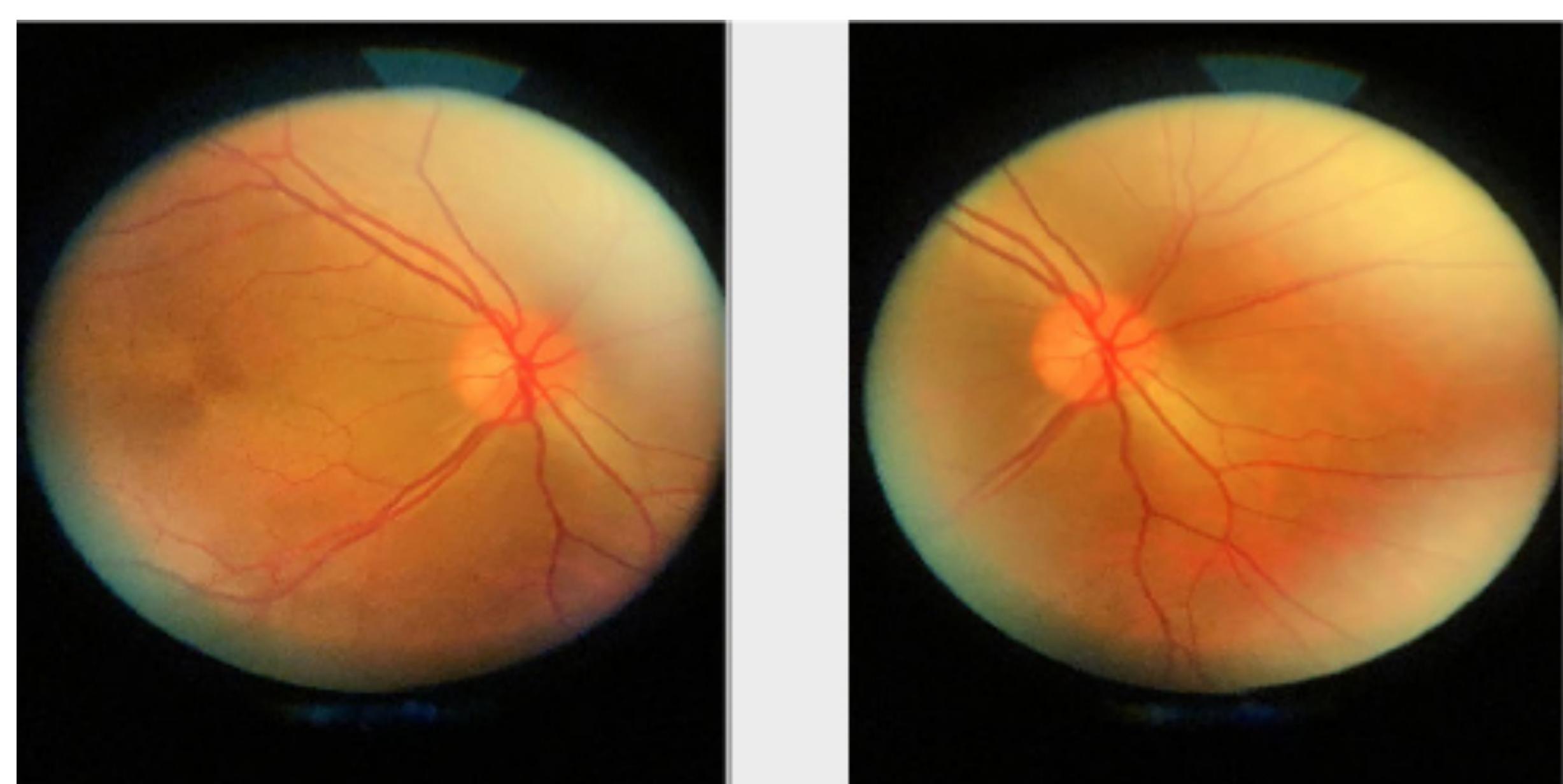


Figure 2: Left & Right Portrait pair of offset images of disc with small shallow cup (L Walsh, using oDocs nun).

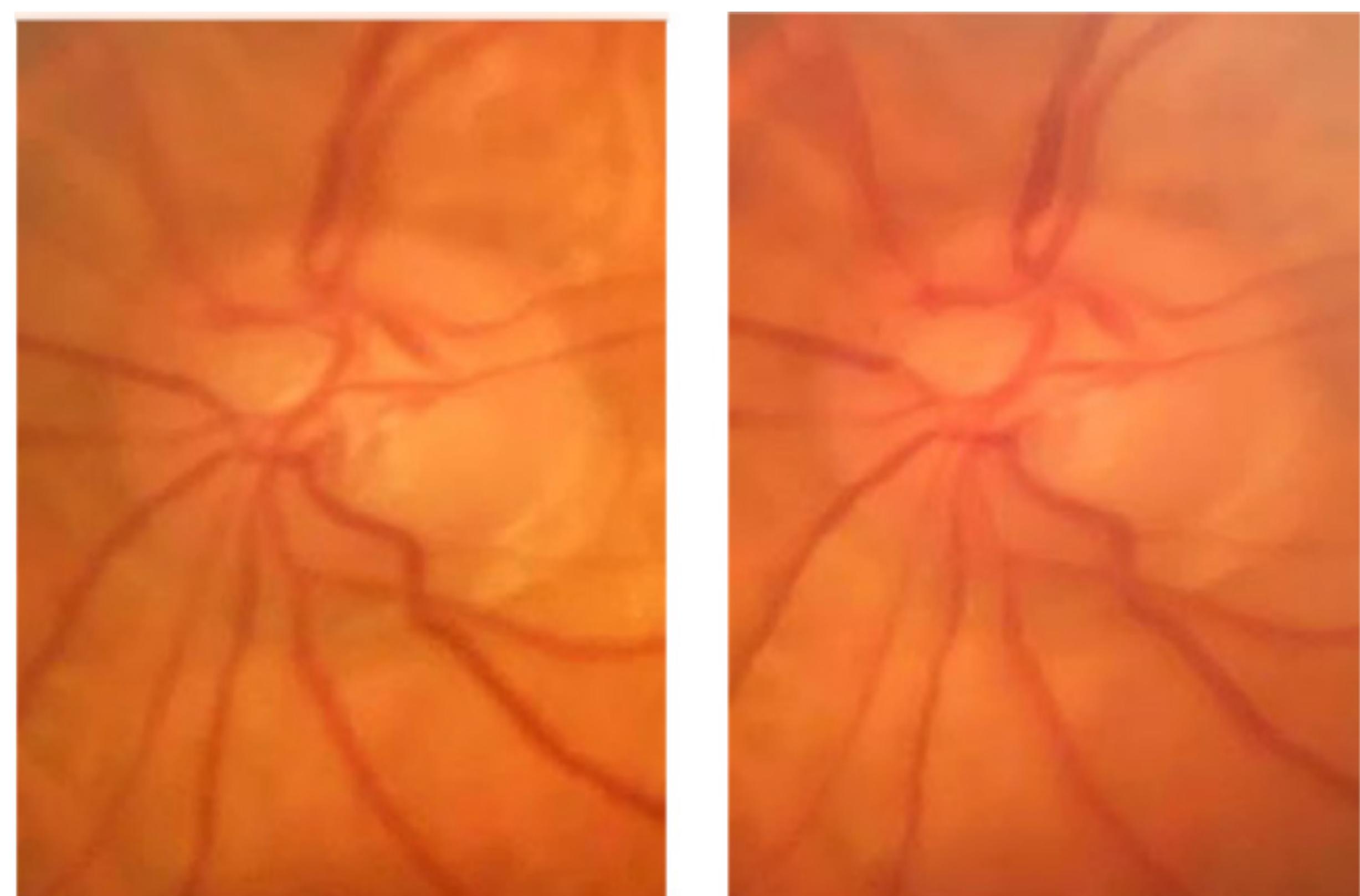


Figure 3: Cupped disc in stereo (from L & R images by L Walsh, using oDocs Nun). The two images have been reversed so that they can be fused without a viewer, using the 'cross-eyed' technique.

RESULTS

Eight paired images were taken, with 3 excluded due to poor image quality or unclear stereoscopic pathology. There were 2 pairings of oedematous discs and three that were shallow or tilted. All images could be viewed successfully stereoscopically by a third party. Some of these attached images are presented for personal stereoscopic viewing and discussion.

DISCUSSION

There is little scope worldwide, outwith highly equipped eye clinics, for imaging three-dimensional fundus pathology and presenting stereoscopically. We hope that our method, still under development, may help to rectify this, adding the undisputed benefits of 3D display to the 2D retinal viewing now generally available with smartphones.

CONCLUSIONS

Portable ophthalmic devices such as the oDocs nun demonstrate potential to produce easily accessible stereoscopic images on any phone screen when combined with commercially available 'apps' and basic handheld viewers; providing significant usefulness in educational and clinical settings.