

Head-Mounted Smartphone-Based Indirect Ophthalmoscopy in Adult Patients With Retinal Diseases: Materials and Methods

C.E. Edoga¹, C.F. Mbakigwe¹ and C.N. Ezisi²

¹Department of Ophthalmology, Enugu State University of Science and Technology Teaching Hospital (ESUT-TH), Parklane, Enugu State, Nigeria.

²Alex Ekwueme University Teaching Hospital, Abakaliki (AEFUTHA), Ebonyi State, Nigeria.

Corresponding author: C. E. Edoga,

Email: dr.edoga@gmail.com

Purpose: To describe an inexpensive modified head-mounted smartphone-based indirect ophthalmoscopy technique for obtaining fundus images in adult patients with retinal diseases.

Materials and Methods: A headset with capacity to hold several kinds of smartphones was designed out of available and affordable materials which included a selfie stick, specially strapped to a construction helmet with a masking tape (Figures 1a & 1b).¹ The smartphone phone to eye distance was adjusted to the comfort of the examiner. The resulting headset was used to take fundus video recordings, through dilated pupils of adult patients with retinal pathologies, using an iPhone SE (Apple Inc., Cupertino, California), a Pan-Retinal 2.2 indirect ophthalmoscopy lens (Volk Optical Inc., Mentor, Ohio) and the FiLMiC Pro mobile

application (Filmic Inc., Seattle, Washington). The procedure was performed in a darkened clinic room with the patients lying supine on an examination couch. The lens to smartphone distance was about 12-15cm while the lens to patient distance was about 5cm. Fine adjustments in positioning and alignment are made until the full image of the patient's retina within the lens fills the screen of the smartphone. Video acquisition time per eye was limited to ninety seconds, with an intervening break period if patient felt discomfort.² Acquisition time was doubled for cases requiring scleral indentation. Screenshots photographs were taken from video frames, labeled and securely stored.

Results: The headset proved to be safe, adjustable and easy to use. Fundus images of acceptable quality were obtained using a regular indirect ophthalmoscope (Figure 2). The head-mounted design also permitted the use of a scleral



Figure 1a: Headset for Smartphone-Based Indirect Ophthalmoscopy

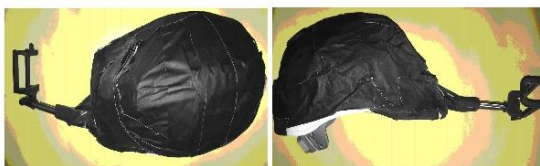


Figure 1b: Headset for Smartphone-Based Indirect Ophthalmoscopy (top and side views)

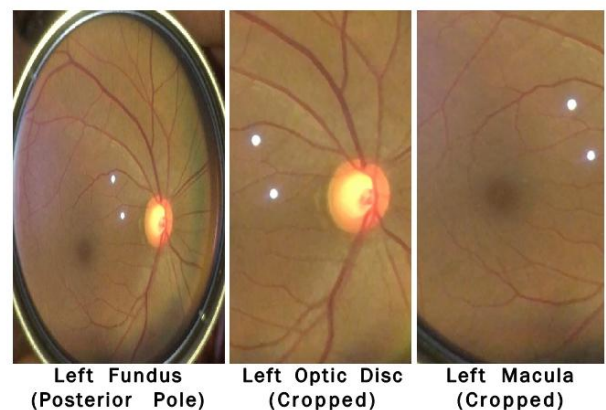


Figure 2: Sample fundus photographs

depressor by the examiner without the need for assistance. The headset system was more intuitive compared with holding the smartphone in one hand and the indirect BIO lens with the other hand.

Conclusion: Indirect ophthalmoscopy using a modified head-mounted smartphone-based setup is possible and allows for viewing/documentation of central and peripheral retina through a dilated pupil.

References

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