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CORRESPONDENCE

Sir,
An alternative method for upper and lower conjunctival fornix measurement

We read with interest the recent article by Jutley *et al*[1] describing a method of objective assessment of conjunctival fornix depth using a custom-made re-usable instrument created by the authors.

We agree wholeheartedly with the authors regarding the value of measuring the fornix depth in cases of cicatrising eye disease, both for assessing the degree of scarring and measuring progression in order to optimize management. Measurements compared to ethnically equivalent normal values (as described in this study) could also facilitate the diagnosis of giant fornix syndrome.[2]

We note that the results with this study's custom device are comparable to previous studies using different devices, and that the authors feel that the type of device used is less important than the familiarity of the user with the technique.

We suggest an alternative measuring technique using a piece of equipment that is already readily available, cheap and disposable: Medline's 6″/15 cm flexible plastic ruler that accompanies surgical skin markers in sterile, single-use packs. We advocate instilling local anaesthetic and trimming the ruler at the 0 mm gradation and alongside the length markings before guiding the device into the centre of the apex of the fornix (Figure 1), with the patient in down-gaze for the superior fornix and up-gaze for the inferior fornix, as per the methods described in the authors' study. The flexible nature of the ruler ensures it conforms to the curvature of the globe, providing comfortable, safe and accurate measurement.

The patient in Figure 1 has symptoms and signs consistent with giant fornix syndrome affecting his left eye. The image demonstrates that the superior fornix is 4 mm deeper on the left side compared with the right side, confirming the diagnosis.

Speed of reading is discussed in the study, with 2 mm gradations embedded within the authors' custom device with red marks at 10 and 20 mm. Similarly, this ruler is quick to read, with individual marks at each millimetre and longer marks at each 5 and 10 mm increment.

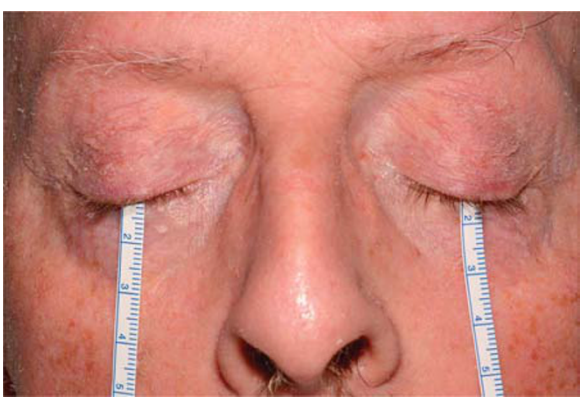

Figure 1 Superior fornix measurement using sterile flexible plastic ruler.

In summary, we propose that the fornix can be accurately and safely measured using an inexpensive, easily available, convenient, sterile, and disposable device.

Conflict of interest

The authors declare no conflict of interest.

References

1 Jutley G, Carpenter D, Hau S, Booth D, Jasim HA, Tay E *et al.* Upper and lower conjunctival fornix depth in healthy white caucasian eyes: a method of objective assessment. *Eye* 2016; **30**: 1351–1358.
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Sir,
Response to: 'An alternative method for upper and lower conjunctival fornix measurement'

We appreciate the authors' interest in our article. We're pleased to hear that a disposable ruler could be a possible alternative to depth measurers made of PMMA. It would be useful to see validation of the measurements taken with this disposable ruler, by interobserver and intraobserver reliability data. Confirming repeatability and reproducibility of the measurements with each device is essential, before recommending the device as an accurate alternative.

One advantage of PMMA fornix depth measurers[1,2] is that they are rigid, therefore reproducibility and repeatability are high. With a flexible plastic ruler, reliably measuring upper fornix depth may be less easy, as one wonders if the ruler may bend to a variable degree over the globe and under the eyelid, potentially giving slightly different measurements depending on the technique and the user.

Conflict of interest

The authors declare no conflict of interest.

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1 Jutley G, Carpenter D, Hau S, Booth D, Jasim HA, Tay E *et al.* Upper and lower conjunctival fornix depth in healthy white caucasian eyes: a method of objective assessment. *Eye* 2016; **30**: 1351–1358.
2 Khan IJ, Ghauri AJ, Hodson J, Edmunds MR, Cottrell P, Evans S *et al.* Defining the limits of normal conjunctival fornix anatomy in a healthy South Asian population. *Ophthalmology* 2014; **121**: 492–497.

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Sir,
Beta-atrophy in Alzheimer's disease

Several studies have shown optic nerve changes in Alzheimer's disease (AD).[1–3] Parapapillary atrophy is classified into two zones:[4] alpha- and beta-atrophy. Beta-atrophy is between the disc and the rim of alpha-atrophy, and appears as small grey fields on a whitish background. Beta-atrophy area measurement is said by Jonas to be more reproducible than the alpha-atrophy area, and is suggested as a preferred outcome.[4] Parapapillary atrophy has never been measured in AD until our prospective case–control study, the methods of which are described elsewhere.[5] The following two populations were sampled: AD patients for cases and cognitively intact individuals over 65 for comparators. Ethical committee approval was granted. Dilated stereoscopic optic disc photography was performed, and all gradings were performed by one masked investigator (MM). A hand-held stereoscope, touch-activated drawing pad, and 'DiscArea' software (University of Iowa, Iowa city, IA, USA) were used. Ungradable disc photographs were excluded. Each participant's right eye was assessed unless ungradable or unavailable; then, the left eye was used. Five per cent of images were selected using random number tables and regraded by an experienced grader (GS). For beta-atrophy area, the intra-observer (kappa = 0.55) and inter-observer agreements were 'moderate' (kappa = 0.51). The mean age of all comparators ($n = 322$) was 77 years (SD 6.8 years) and that of cases ($n = 258$) 80 years (SD 7.7 years). Images were gradable in 193 cases and 274 comparators. In a univariate analysis, area of beta-atrophy was not associated with AD status ($P = 0.4$). Potentially confounding variables were picked. There was a significant difference (Mann–Whitney *U*-test; $P < 0.001$) between the ages of AD cases and comparators, and age was, therefore, included in all models. Smoking was associated with the AD status ($\chi^2 = 4.4$, df = 1, $P = 0.04$), and given the reported association of smoking with primary open angle glaucoma, smoking status was included. A diagnosis of glaucoma had been made and/or topical ocular hypotensive agents were being used in 3.7% of comparators (12/322) and 6.2% of cases (16/258; $\chi^2 = 1.9$, df = 1, $P = 0.17$). Systemic beta-blockers were used by 25.4% of comparators (75/295) and by 18.6% of AD cases (44/237; $\chi^2 = 3.6$, df = 1, $P = 0.059$). Area of beta-atrophy (in pixels) was positively skewed: after log transformation to base 10, distribution was normal. Binary logistic regression with AD status (case or comparator) as the dependent variable and backward stepwise elimination led to a model in which age ($P < 0.001$, OR = 1.005, 95% CIs 1.0002–1.007) and use of systemic beta-blockers ($P = 0.032$, ORs = 1.7, 95% CIs 1.0–2.9) were associated with the AD status, but $\log_{10}$ beta-atrophy area was not ($P = 0.670$, ORs = 1.000). As in any clinical study on AD, 'cases' may have included some mixed or even vascular dementia cases; however, this study has a large sample size compared with previous studies on ophthalmic findings and AD. Analysis of ocular changes has potential value for the early detection of or monitoring of AD. Retinal photography does not rely on expensive or unwieldy equipment. The findings from our sample, however, suggest that beta-atrophy area would not be a useful measure in an AD test-battery.

Conflict of interest

The authors declare no conflict of interest.

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