Table 2 Results of linear mixed model (after accounting for the correlations between fellow eyes of the same subject) showing the effects of age, gender and corneal thickness on corneal birefringence measurements

Parameter	Age		Gender		CCT	
	β (SE)	P	β (SE)	P	β (SE)	P
CPA	0.03 (0.06)	0.54	-1.08 (1.78)	0.55	0.003 (0.01)	0.84
CPM	-0.02 (0.15)	0.90	4.74 (4.83)	0.33	-0.01 (0.03)	0.83

Abbreviations: CCT, central corneal thickness; CPM, corneal polarization magnitude; CPA, corneal polarization axis; β , coefficient; SE, standard error.

CPM reported by Weinreb *et al*³ also ranged between 22 and 150 nm. These differences in corneal birefringence properties may indicate differences in the internal structure of the cornea, which may be responsible in part to the differences in the prevalence and progression of corneal ectatic conditions like keratoconus between ethnicities.⁵

Conflict of interest

Rao HL and Garudadri CS are consultants at Allergan. Garudadri CS is also a consultant at Merck and Alcon. All other authors declare no conflict of interest.

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Sir,

A standardised technique for locating periocular lesions and biopsy sites

In tertiary referral centres a number of patients are referred with eyelid malignancies, which have been confirmed by biopsy. The precise location of the biopsy is not always specified and this can lead to a dilemma if the biopsy site has healed. A similar problem exists when a seemingly benign lesion is treated by excision biopsy and turns out to be malignant. Pre-operative photography has usually not been performed due to the lesion appearing benign. The original biopsy site is often difficult to locate owing to rapid healing.

A standardised localisation technique would be helpful in the further management of these patients. Trilateration is used in surveying, navigation, and global positioning systems. It involves the determination of absolute or relative locations of points by the measurement of distances using the geometry of spheres or triangles (<http://gps.about.com/od/glossary/g/trilateration.htm>). In a 2D plane, using the medial and lateral canthi as reference points, trilateration locates two points (Figure 1). Then specifying whether the site is in the upper or the lower lid narrows it down to one location.

Small lesions <10 mm diameter and biopsy sites were localised by measuring the following:

- Distance (mm) from the centre to the medial canthus.
- Distance (mm) from the centre to the lateral canthus.
- Distance (mm) from the centre to the lid margin (grey line) if located away from the lid margin.

For larger lesions >1 cm diameter measurements should be taken to the medial and lateral margins of the lesion for documentation.

Measurements in the lower eyelid are made with the eye open and in the upper lid with the eye gently closed. The dimensions of all lesions are recorded as standard along the long axis and at 90°.

Figure 1 Trilateration of lower eyelid lesion.

During the 6 month pilot of the technique, there were two cases where a seemingly benign lesion showed histological malignancy (BCC) after excision.

Conclusion

Accurate localisation is essential for both excision and incision biopsies. The 2D trilateration technique, using the medial and lateral canthi as reference points, is particularly useful if the patient without baseline photographs is referred to another unit. We would advocate this simple technique for localising all lesions on or near the lid margin.

Conflict of interest

The authors declare no conflict of interest.

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Sir,

Virtual reality phacoemulsification training

Virtual reality surgical simulation training improves resident performance as measured by the simulator itself and wet-lab performance.^{1,2} However, there is little published data showing that simulators improve 'real life' resident surgery performance.³

We performed a retrospective comparative consecutive study of resident surgical outcomes at our institution (approved by the Institutional Review Board of Henry Ford Health System, Detroit, MI, USA) before and after the introduction of the Eyesi surgical simulator (VRmagic, Mannheim, Germany). The first 50 phacoemulsification cases of 20 residents (5 residents completing residency per academic year, 2007–2010) were studied. Simulator-group residents were required to complete at least 6 h of simulator training. All 20 residents received significant wet-lab training (24 h structured course, including 4 h of wet-lab phaco), and surgical case supervision and coaching. Both the simulator and the wet-lab were easily accessible for residents who wanted additional training. Outcome measures were the incidence of posterior capsule tears and operating time.

The nonsimulator and simulator groups each comprised 500 cases with 40 and 35 posterior capsule tears, respectively. Analysis of the first 25 cases of each resident yielded complication rates of 8.8% and 10.0% for the nonsimulator and simulator groups, respectively, and 7.2% and 3.6% ($P=0.11$) for cases 26 through 50, respectively. The percentage of long cases (defined as >40 min) for cases 10 through 50 was 42.3% and 32.4% ($P=0.005$) for the nonsimulator and simulator groups, respectively (Figure 1).

Figure 1 Bar graph of the percentage of resident cases with surgical time greater than 40 min. Each 10 cases for each of the 10 residents in the two groups (~100 cases per group) are compared using the χ^2 test.

Comment

As the simulator residents performed better for their later cases, it appears that simulator training was beneficial for trainees who have commenced 'live surgery' training. Possible reasons for the nonsimulator residents performing better for their initial cases could be more attending intervention or conversely, superior natural resident ability. Because of the retrospective data collection, we were not able to differentiate between these possibilities. Other study limitations were that variation in resident and patient characteristics could not be accounted for. Study strengths include consistent surgical technique (divide and conquer), instrumentation, and surgical instructors. Our study supports the suggestion that the addition of virtual reality surgical training to an established surgical training program slightly shortens the learning curve for the first 50 phacoemulsification cases.

Conflict of interest

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