Accuracy of user-adjusted axial length measurements with optical biometry in eyes having combined phacovitrectomy for macular-off rhegmatogenous retinal detachment

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PURPOSE: To evaluate the accuracy of user-adjusted axial length (AL) measured by optical biometry for intraocular lens (IOL) calculations in eyes having combined phacovitrectomy for macula-off rhegmatogenous retinal detachment (RRD).

SETTING: Ophthalmology Department, Calderdale Royal Hospital, Halifax, United Kingdom.

DESIGN: Retrospective case series.

METHODS: Consecutive eyes having phacovitrectomy for macula-off RRD were evaluated. The ALs were measured using optical biometry with user adjustment to identify a posterior peak corresponding to the eye's AL and ultrasound (US). These were compared with each other and with the postoperative optical biometry and analyzed for accuracy as an indication of the eye's AL.

RESULTS: The study comprised 22 eyes of 22 patients. There was no statistically significant difference between the mean AL measurements derived from user-adjusted optical biometry and US AL ($P = .964$). The user-adjusted optical biometry was not statistically significantly different from the postoperative optical biometry ($P = .242$). Compared with the postoperative optical biometry, the IOL power was within ± 0.5 diopter in 12 (92%) of 13 cases (95% confidence interval [CI], 77.8 to 100.0) for user-adjusted optical biometry and in 10 (77%) of 13 cases (95% CI, 54.0 to 99.8) for US measurements.

CONCLUSIONS: User-adjusted optical biometry could be used as an alternative method for measuring AL in macula-off RRD with combined phacovitrectomy. However, optical biometry would require assessment of agreement with US AL in cases in which a posterior peak is not easily identifiable. User-adjusted optical biometry might outperform US AL when calculating IOL power; however, a larger study should be performed to confirm this.

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Combined phacoemulsification and pars plana vitrectomy (phacovitrectomy) has become a common procedure for many vitreoretinal diseases, including as primary repair surgery for rhegmatogenous retinal detachment (RRD).[1–4] This is a result of the continual advances in cataract surgery and vitrectomy surgery and favorable patient outcomes. The combined procedure reduces costs and offers quicker visual rehabilitation by avoiding the need for additional surgery and allowing a single recovery period.[5–7] The aphakic state during surgery also gives excellent visibility, ensuring an unimpeded view for the treatment of the peripheral pathology common in RRD.[8]

As the anatomic success of combined surgery has improved, greater attention has been directed toward reducing refractive error to maximize postoperative

visual function. Our previous large case series study[1] found the refractive results of phacovitrectomy for RRD to be comparable with cataract surgery outcomes. Overall, although optical biometry was more accurate than ultrasound (US) ($P = .040$), we found that significantly more US-measured axial lengths (ALs) were preferentially selected over optical biometry measurements in the macula-off group than in the macula-on group ($P = .016$). We concluded that the biometry used for intraocular lens (IOL) power selection must be checked by comparing it with that in the fellow eye and the known refraction, especially in macula-off RRD cases.

The accuracy of AL measurement is crucial for IOL power calculation, and the presence of a bullous detached macula is likely to make AL measurements more challenging. It was our clinical observation that when used for AL measurements in macula-off RRD cases, optical biometry tended to underestimate the true AL (confirmed by the anterior position of the signal peak, even in the presence of a good signal-to-noise ratio [SNR]) (Figure 1). Hence, we performed a prospective analysis of the preoperative AL and postoperative AL measurements of all macula-off RRD cases having phacovitrectomy as the primary repair to evaluate a new technique of optimizing the accuracy of AL measurement with optical biometry termed the user-adjusted optical biometry measurement.

PATIENTS AND METHODS

The study evaluated consecutive macula-off RRD patients who had combined phacovitrectomy surgery performed by the same surgeon (R.R.) from November 2012 to August 2014.

The ALs were measured using optical biometry with partial coherence interferometry (PCI) (IOLMaster, version 5.4, Carl Zeiss Meditec AG) and US A-scan (Echoscan US-1800, Nidek Co. Ltd.) before phacovitrectomy at presentation of macula-off RRD. Skilled operators performed 10 reliable readings using optical biometry and US. When a posterior peak was not automatically selected in the primary optical biometry, AL measurements were manually adjusted by the biometry operator shifting the signal peak selection from the default anterior peak to a more posterior peak with an SNR of 2 dB or more (Figure 1). In this study, this method is termed user-adjusted optical biometry, and it has been previously described by Steel.[9] When the optical biometry produced a scan with multiple peaks and no defined single posterior peak, the posterior peak correlating to the AL was guided by the fellow eye's AL or the ipsilateral US AL.

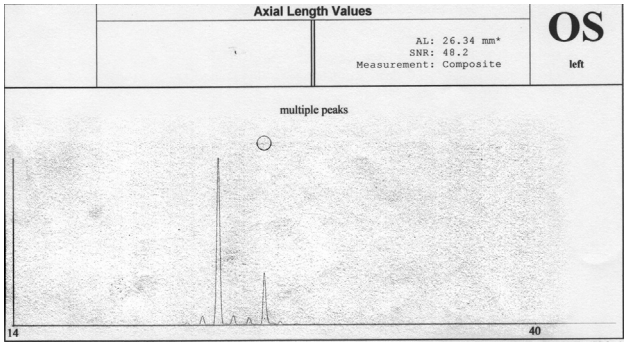

Figure 1. Composite optical biometry showing a posterior retinal peak (AL = axial length; SNR = signal-to-noise ratio).

All study eyes had the AL remeasured using optical biometry after at least 8 weeks postoperatively. The user-adjusted optical biometry was then compared with the preoperative US and with the postoperative optical biometry measurements and analyzed for statistical difference using paired-samples t tests. Assumptions for parametric testing were tested before the tests were performed. Secondary within-group comparisons and between-group comparisons of subsets of the full sample were done using nonparametric tests (Wilcoxon signed-rank test and Mann-Whitney U test) because of very small sample sizes.

RESULTS

This retrospective case series analysis comprised 22 eyes of 22 patients. The patients had a mean age of 62.6 years, and 17 (77.3%) of the 22 were men. The mean postoperative AL measurement used for biometry calculation in our study was 25.6 mm ± 2.23 (SD) (range 20.97 to 29.64 mm).

Eighteen (81.8%) of the 22 patients had good-quality, interpretable optical biometry, comprising 13 user-adjusted and 5 primary unadjusted optical biometry measurements. The 5 patients with well-defined single peaks on optical biometry did not require user adjustment.

Thus, 13 eyes (59%) with user-adjusted optical biometry were included in the comparison of user-adjusted optical biometry and postoperative optical biometry. Eight of the scans had a well-defined second posterior peak that did not require assessment of agreement with the fellow eye's AL or ipsilateral US AL scans. Five scans required some consideration of the fellow eye or ipsilateral US AL to shift to a correlating posterior peak among other more posterior peaks.

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