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REFERENCES

1 **Courtney P**. The National Cataract Surgery Survey: i. Method and descriptive features. *Eye* 1992;**6**(Pt 5):487–92.
2 **Department of Health**. *Action on cataracts:good practice guidance*, London, UK:NHS Executive 2000.
3 **Department of Health**. Hospital activity and episode statistics, headline figures from 1998 to 2006. http://www.hesonline.nhs.uk/Ease/servlet/ContentServer?siteID=1937&categoryID=193 (accessed 4 Apr 2007).
4 **Lundstrom M**, Stenevi U, Thorburn W. The Swedish National Cataract Register: a 9-year review. *Acta Ophthalmol Scand* 2002;**80**:248–57.
5 **Monestam E**, Wachtmeister L. Dissatisfaction with cataract surgery in relation to visual results in a population-based study in Sweden. *J Cataract Refract Surg* 1999;**25**:1127–34.
6 **Royal College of Ophthalmology**. The Royal College of Ophthalmologists cataract surgery guidelines. 2004. http://www.rcophth.ac.uk/docs/publications/CataractSurgeryGuidelinesMarch2005Updated.pdf (accessed 4 Apr 2007).
7 **Desai P**. The National Cataract Surgery Survey: iI. Clinical outcomes. *Eye* 1993;**7**(Pt 4):489–94.
8 **Desai P**, Reidy A, Minassian DC. Profile of patients presenting for cataract surgery in the UK: national data collection. *Br J Ophthalmol* 1999;**83**:893–6.
9 **Johnston RL**, Sparrow JM, Canning CR, *et al*. Pilot National Electronic Cataract Surgery Survey: i. Method, descriptive, and process features. *Eye* 2005;**19**:788–94.
10 **Keenan TD**, Rosen P, Yeates D, *et al*. Time trends and geographical variation in cataract surgery rates in England: study of surgical workload. *Br J Ophthalmol* 2007;**91**:901–4.

OCT for clinical detection and monitoring of glaucoma?

Optical coherence tomography for clinical detection and monitoring of glaucoma?

Christopher Bowd

OCT and all imaging technologies should be used in conjunction with careful clinical examination when making diagnostic and treatment decisions

Optical coherence tomography (OCT) has been used clinically for the detection of glaucoma for over a decade; however, its clinical usefulness has not been particularly well documented. Although many studies have shown that OCT measurements can discriminate between healthy and glaucomatous eyes, the great majority of studies demonstrating this have had limited clinical value. This is because most analyses were based on measurements of retinal nerve fibre layer (RNFL) thickness provided as continuous variables, and a great deal of overlap between measurements in healthy and glaucomatous eyes was observed. This made it difficult to determine what values should be used clinically as limits for classifying eyes as diseased, and in most published studies, no limits were recommended. Nonetheless, the performance of OCT for detecting RNFL thinning in glaucoma has been impressive given its limited number of data points (current maximum 512 A-scans) and relatively unsophisticated analyses (primarily measurements of global and local RNFL thickness).

Recently, a normative database has been added to the latest version of OCT (StratusOCT, Carl Zeiss Meditec, Dublin, California, USA), allowing comparisons of measurements of RNFL thickness with measurements from 328 healthy eyes, thus providing clinicians with potentially useful thresholds to aid in the determination of disease. Printouts from the StratusOCT display RNFL normative database information in the form of clinically helpful colour-coded graphs and charts. This is a significant improvement in the value of this technology because the clinician is now provided with additional information about measurements, including whether they are within normal limits, borderline or outside of normal limits relative to a healthy population.

A small number of studies have investigated the ability of StratusOCT normative data-based thresholds (ie, cut-offs) for classifying healthy and diseased eyes.[1–5] In this issue of, *British Journal of Opthalmology* Hood *et al*[6] (***see page 905***) describe the success of a variety of thresholds (and combinations thereof) for classifying eyes as healthy or glaucomatous. Their results indicate that the StratusOCT normative database is useful for detecting known glaucoma (defined as eyes with standard automated perimetry (SAP) and multifocal visual evoked potential defects), with sensitivities as high as 95% at a specificity of 98%. The most important outcome of their study is the identification of specific thresholds that are probably effective for detecting glaucoma. The study by Hood *et al* validates the use of OCT and the StratusOCT normative database for the detection of glaucoma, and provides the clinician with suggested thresholds by which to classify eyes, while providing researchers with suggested thresholds to investigate using independent subject populations.

It will be interesting to determine the usefulness of these suggested thresholds for detecting early or suspected glaucoma. We recently showed that OCT measurements are, predictably, less effective at classifying eyes with early disease than classifying those with advanced disease (with disease severity defined as degree of visual field defect).[7] For instance, the sensitivity (at fixed specificity = 85%) of OCT-measured average RNFL thickness for detecting glaucomatous eyes with average-sized discs decreased from 94% to 73% when the SAP Advanced Glaucoma Intervention Study score[8] decreased from 9 to 0. This finding suggests that the reported success of classification of glaucomatous eyes by OCT has probably been overestimated relative to the population in which it holds the most clinical utility, early or suspicious (ie, ''pre-perimetric'') glaucoma. Although it is important to demonstrate that a new imaging instrument can discriminate between healthy eyes and those with known glaucoma from a technology validation standpoint, in clinical practice one does not need an imaging test to differentiate a patient with repeatable glaucomatous visual field defects from an individual with no suspicion of disease. The more interesting (and important) question is, can the StratusOCT technology detect disease in patients suspected of having glaucoma, such as those who do not yet have repeatable visual field loss on SAP? Currently, some evidence suggests that this is the case.[2 9]

In general, it is accepted that OCT measurements can discriminate between healthy and glaucomatous eyes. For this task, the performance of StratusOCT compared with confocal laser ophthalmoscopy and scanning laser polarimetry has been impressive.[3 10] However, other aspects of OCT performance are yet to be investigated. Primarily, it is unclear whether the current version of OCT can effectively detect RNFL thinning over time in glaucomatous eyes. One reason this has not been well tested is because of a recent update in OCT technology that rendered measurements obtained with previous OCT versions incompatible with those from the current version.[11] Incompatible technology upgrades limit the available follow-up time for assessing

glaucomatous change (StratusOCT was introduced in 2001 and glaucoma, specially when treated, is a slowly progressing disease). Furthermore, no progression algorithms are currently available for OCT beyond linear regression analysis of changes in measurements over time. The difference between clinically significant change and short-term and/or long-term measurement variability for OCT measurements has not been determined, although arbitrary cut-offs based on image resolution have been suggested.[12] Other imaging technologies have incorporated sophisticated progression analyses that are yet to be incorporated in the OCT (to be fair, these algorithms developed by other manufacturers have not been well tested). Finally, it is not clear whether the current image registration techniques used by OCT will allow sensitive detection of change.

Overall, although OCT can clearly identify thinner RNFLs in glaucomatous eyes compared with healthy eyes, the usefulness of the StratusOCT normative database has not been well established in patients suspected of having glaucoma (ie, the population of most interest). In addition, the ability of OCT measurements to detect glaucomatous change has not been demonstrated. Cutting-edge advances in OCT technology[13–16] such as high-resolution spectral/Fourier domain OCT and OCT–confocal scanning laser hybrids are theoretically promising (and exciting), but it will be some time before these technologies have been scrutinised to the point that their clinical use can be recommended by evidence-based studies. In general, it is important that OCT and all imaging technologies be used in conjunction with careful clinical examination when making diagnostic and treatment decisions for glaucoma.

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REFERENCES

1 **Badlani V**, Shahidi M, Shakoor A, *et al*. Nerve fiber layer thickness in glaucoma patients with asymmetric hemifield visual field loss. *J Glaucoma* 2006;**15**:275–80.
2 **Kim TW**, Zangwill LM, Bowd C, *et al*. Retinal nerve fiber layer damage as assessed by optical coherence tomography in eyes with a visual field defect detected by frequency doubling technology perimetry but not by standard automated perimetry. *Ophthalmology* 2007 (E-pub) http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dapt=Citation&list_uids=17239441.
3 **Medeiros FA**, Zangwill LM, Bowd C, *et al*. Comparison of the GDx VCC scanning laser polarimeter, HRT II confocal scanning laser ophthalmoscope, and stratus OCT optical coherence tomograph for the detection of glaucoma. *Arch Ophthalmol* 2004;**122**:827–37.
4 **Shah NN**, Bowd C, Medeiros FA, *et al*. Combining structural and functional testing for detection of glaucoma. *Ophthalmology* 2006;**113**:1593–602.
5 **Jeoung JW**, Park KH, Kim TW, *et al*. Diagnostic ability of optical coherence tomography with a normative database to detect localized retinal nerve fiber layer defects. *Ophthalmology* 2005;**112**:2157–63.
6 **Hood D**, Harizman N, Kanadani FN, *et al*. Retinal nerve fiber thickness measured with optical coherence tomography (OCT) accurately detects confirmed glaucomatous damage. *Br J Ophthalmol* 2007;**91**:905–7.
7 **Medeiros FA**, Zangwill LM, Bowd C, *et al*. Influence of disease severity and optic disc size on the diagnostic performance of imaging instruments in glaucoma. *Invest Ophthalmol Vis Sci* 2006;**47**:1008–15.
8 **Advanced Glaucoma Intervention Study**. 2. Visual field test scoring and reliability. *Ophthalmology* 1994;**101**:1445–55.
9 **Bagga H**, Feuer WJ, Greenfield DS. Detection of psychophysical and structural injury in eyes with glaucomatous optic neuropathy and normal standard automated perimetry. *Arch Ophthalmol* 2006;**124**:169–76.
10 **Deleon-Ortega JE**, Arthur SN, McGwin G Jr, *et al*. Discrimination between glaucomatous and nonglaucomatous eyes using quantitative imaging devices and subjective optic nerve head assessment. *Invest Ophthalmol Vis Sci* 2006;**47**:3374–80.
11 **Bourne RR**, Medeiros FA, Bowd C, *et al*. Comparability of retinal nerve fiber layer thickness measurements of optical coherence tomography instruments. *Invest Ophthalmol Vis Sci* 2005;**46**:1280–5.
12 **Wollstein G**, Schuman JS, Price LL, *et al*. Optical coherence tomography longitudinal evaluation of retinal nerve fiber layer thickness in glaucoma. *Arch Ophthalmol* 2005;**123**:464–70.
13 **Drexler W**. Ultrahigh-resolution optical coherence tomography. *J Biomed Opt* 2004;**9**:4774.
14 **Fujimoto JG**. Optical coherence tomography for ultrahigh resolution in vivo imaging. *Nat Biotechnol* 2003;**21**:1361–7.
15 **Podoleanu AG**, Dobre GM, Cucu RG, *et al*. Sequential optical coherence tomography and confocal imaging. *Opt Lett* 2004;**29**:364–6.
16 **Romero-Borja F**, Venkateswaran K, Roorda A, *et al*. Optical slicing of human retinal tissue in vivo with the adaptive optics scanning laser ophthalmoscope. *Appl Opt* 2005;**44**:4032–40.

VIDEO REPORT

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Apraxia of lid opening

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ABSTRACT

We describe eyelid movement abnormalities in an 80-year-old man with apraxia of lid opening (ALO), resulting from involuntary levator palpebrae inhibition (ILPI) and pretarsal orbicularis oculi (OO) contraction. He was unable to open his lids at will following closure. Attempted eye opening resulted in forceful contraction of the frontalis muscle, backward thrusting of the head and lengthened lid closure. The inability to reopen the lids was not evident during spontaneous reflex blinking and he had no difficulty in keeping the lids open once they had been manually lifted up. There were no episodes of involuntary drooping of the eyelids or spasmodic contraction of the OO causing involuntary eyelid closure. Pursuit eye movements were not restricted, the vestibulo-ocular reflex was preserved and both horizontal and vertical saccades were normal. Despite the clinically visible persistence of pretarsal OO activity, treatment with botulinum toxin injections in the pretarsal and preseptal portions of the muscle did not reduce his difficulty in initiating lid elevation but he found some benefit using lid crutches. ALO is thought to be due to an abnormality in the supranuclear control of eyelid movement. ILPI can present either isolated or combined with blepharospasm. The excitatory levator palpebrae response necessary to lift the lids up is likely to be in very close connection with the OO antagonistic inhibitory response. Alterations in one or another pre-motor structure may result in inability to raise the lids due to inhibition of the levator palpebrae as well as persistence of the pretarsal OO.

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