The diagnosis of advanced glaucoma is straightforward using clinical assessment of the cupped optic disc, field defects identified using white-on-white (W-W) automated perimetry, and measurement of intraocular pressure (IOP). Diagnosis of early glaucoma is, however, more challenging. There are, however, important benefits from early diagnosis:

1) Improved visual prognosis
2) Improved understanding of the natural history of glaucoma, and response to treatment.

The earliest signs of glaucomatous damage are often, though not always, structural, including thinning of the retinal nerve fibre layer (RNFL), and optic disc neuro-retinal rim (NRR). Functional damage is usually a later sign of disease. Importantly, however, detection of a glaucomatous visual defect helps to confirm the diagnosis, and correlates most closely with symptoms, and, in advanced disease, the patient’s quality of life.

**Retinal nerve fibre layer**

Loss of RNFL thickness has been shown to be a sensitive early sign of glaucoma damage. RNFL polarimetry (GDx VCC) has demonstrated useful sensitivity and specificity in separating glaucoma patients from normal in some studies, though not in others, and it is not widely used alone as a diagnostic test. OCT imaging may be shown to provide superior diagnostic precision, but the place of this imaging technology in glaucoma detection is not yet clear (not least because of the rapid pace of development of the technology).

**Optic disc**

Fundamental work on the characteristics of the normal optic disc size, and NRR shape, by J Jonas and other workers has resulted in useful guidelines to improve clinical, qualitative disc assessment. An estimate of the size of the optic disc is important to allow meaningful interpretation of the cup/disc ratio. Application of the ‘ISNT’ rule to the appearance of the NRR allows accurate identification of early glaucoma damage, though the rule is not so useful (though less required) in more advanced disc damage (Morgan et al). More quantitative analysis of optic disc topography was made possible by developments in digital stereo-photography, and scanning laser ophthalmoscopy (‘HRTII’). More recently, OCT imaging has provided more precise quantification of ONH topography.

**Functional tests**

Conventional W-W perimetry has become more practical for use in case-finding with the development of fast thresholding techniques (HFA SITA). Blue-on-Yellow (SWAP) perimetry is claimed to be more sensitive than W-W, but is more susceptible to false positive test results caused by cataract. Frequency Doubling Perimetry (FDP) has useful diagnostic sensitivity, but may also be susceptible to the effects of cataract. Motion perimetry, as an example of a hyper-acuity measure, offers the promise of a more robust test of function, though is currently at an earlier stage of development.

**Summary**

As a result of the relatively low sensitivity and specificity of any of the diagnostic tests used alone, a combination of the conventional tests of visual field, optic disc and IOP is still the ‘goldstandard’ for the diagnosis of established glaucoma. In spite of the current definitions of glaucoma emphasising characteristic patterns of optic disc and visual field damage, IOP remains important as a diagnostic test, not least to ensure that high-risk OHT, and secondary glaucomas are not missed. Examination of the anterior segment is also arguably an essential component, to avoid missing angle closure risk, and signs of important secondary glaucomas including PXF and PDS. Developments in optic disc topography (eg HRTII and OCT) now allow cost-effective, quantitative, measurement of optic disc features. New tests of visual function may allow detection of visual loss prior to W-W defects. Finally, genetic techniques may allow genuinely early quantification of glaucoma risk, even before the onset of glaucomatous damage, but currently are only applicable to the small proportion of rare, highly heritable, early onset glaucomas which are prevalent in specific pedigrees eg congenital and juvenile/young adult onset disease.