Humphrey Field Analyzer II Glaucoma Progression Analysis Case

By Murray Fingeret, OD

This 77 year old African American Male was diagnosed with Primary Open Angle Glaucoma in 1996. At the time of diagnosis, the intraocular pressure was elevated in each eye (maximum IOP OD 28 mm Hg, OS 25 mm Hg) with damage confined to the right eye (Figure 1A, B). Corneal thickness measurements were 525 µm OD, 523 µm OS and gonioscopy revealed wide open angles OU. Therapy was begun utilizing latanoprost in each eye once daily at bedtime, which lowered the IOP to approximately 16-18 mm Hg in each eye. The initial visual field (9/25/1996) for the right eye showed an inferior partial arcuate scotoma with excellent reliability (Figure 2A) while the left field showed mild diffuse loss (Figure 2B).

The patient was lost to follow-up for 2 years, during which time he did not use his glaucoma medications. Therapy was reinstituted and a field performed on 9/30/1998 which showed field loss in the right eye to have increased in size (figure 2A) with a full inferior arcuate scotoma now apparent. The left eye's field was considered to be within normal limits. The patient was then followed with fields done on a yearly basis, with the mean deviations (MD) graphed on the bottom of the first page (figure 2A, 2B).

In figure 2A, two OD baseline fields are plotted using the Glaucoma Progression Analysis (GPA). Follow-up fields can then be compared to an average of the two baseline fields. An MD regression analysis of all the fields is seen at the bottom of the first page. All fields show reliability indices that are well within acceptable limits. The second field (1998) shows fewer significant points on the total deviation maps, and reduced MD loss relative to the first field, probably due to learning effects.

The patient was followed over time, with the IOP remaining stable in the mid to high teens using latanoprost only. Looking at the progression analysis plot for the right eye (far right side of figure 3), for the 1999 field, there are 3 points flagged with an X which indicates those points to be so deeply damaged that the significance of further change could not be determined. Also, there are two points flagged with an open triangle indicating that they have gotten significantly worse relative to baseline. The progression analysis plot for the right field performed in 2000 showed one point to have gotten worse on two consecutive fields (as seen by the half-filled triangle) and two points to have gotten worse on this field only. The 2001 field shows that the same point seen as worsening in 2000 has continued to show change (noted now on two consecutive fields). Also, for this field several additional points are flagged as getting worse for the first time. Looking at the regression analysis slope for the right eye (lower part of figure 2A), the points are moving downward indicating that the MD is getting worse. Looking at the individual test results, the MD has changed from -9.24 dB in 1996 to -11.88 in 2001. This trend, indicating worsening can not be explained on the basis of developing cataracts as the visual acuities and lens assessment were unchanged. The 2002 field, again reliable, shows progression to be continuing though the MD is slightly improved (Figure 4A).

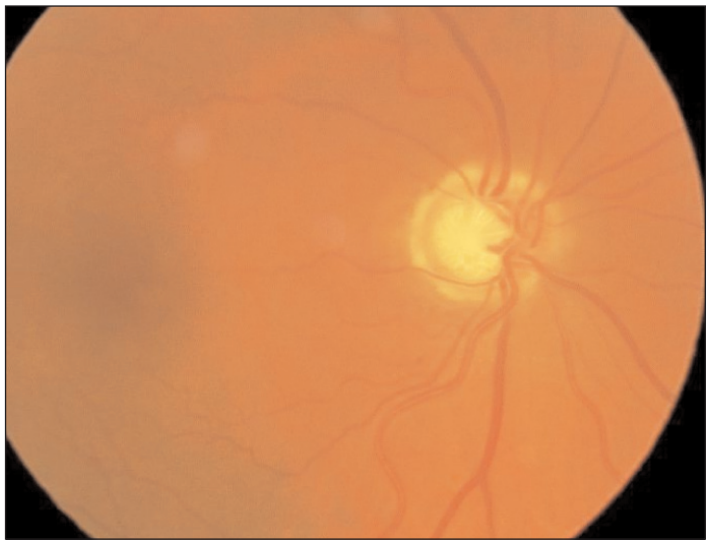

Figure 1A. OD

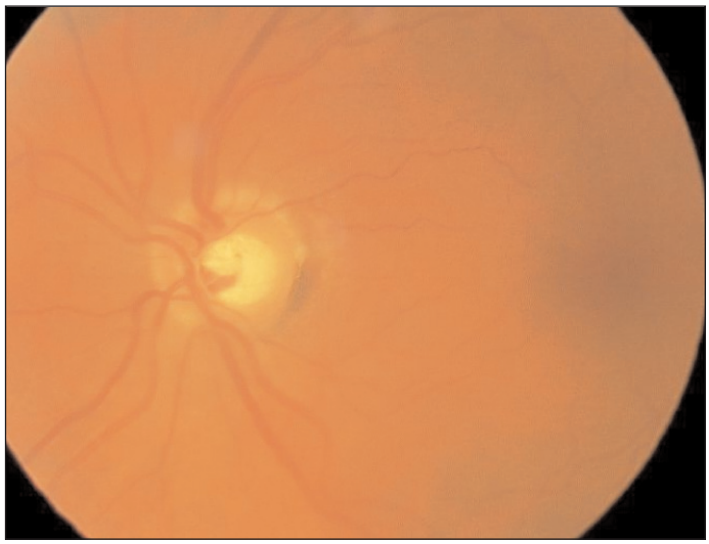

Figure 1B. OS

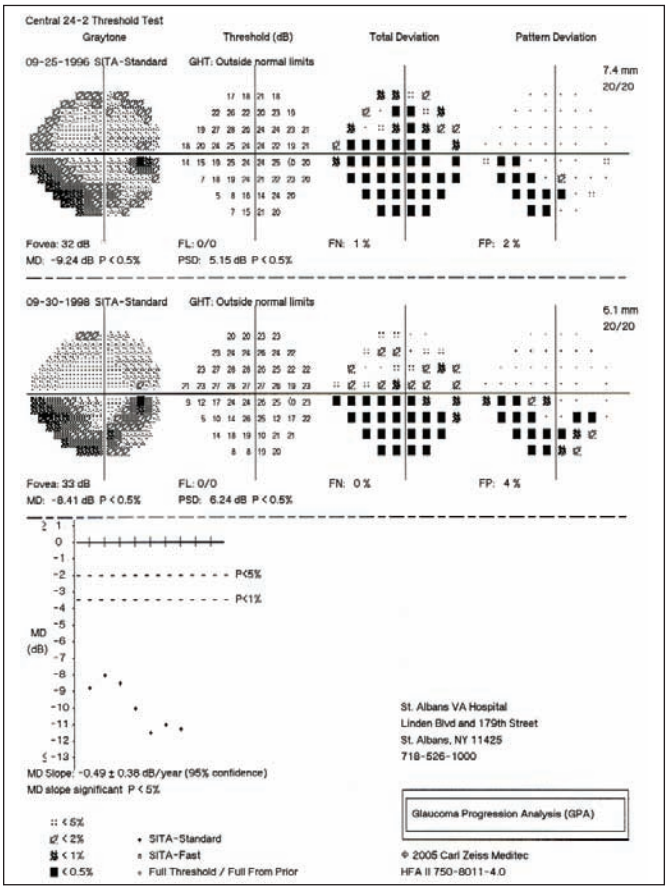

Figure 2A. OD

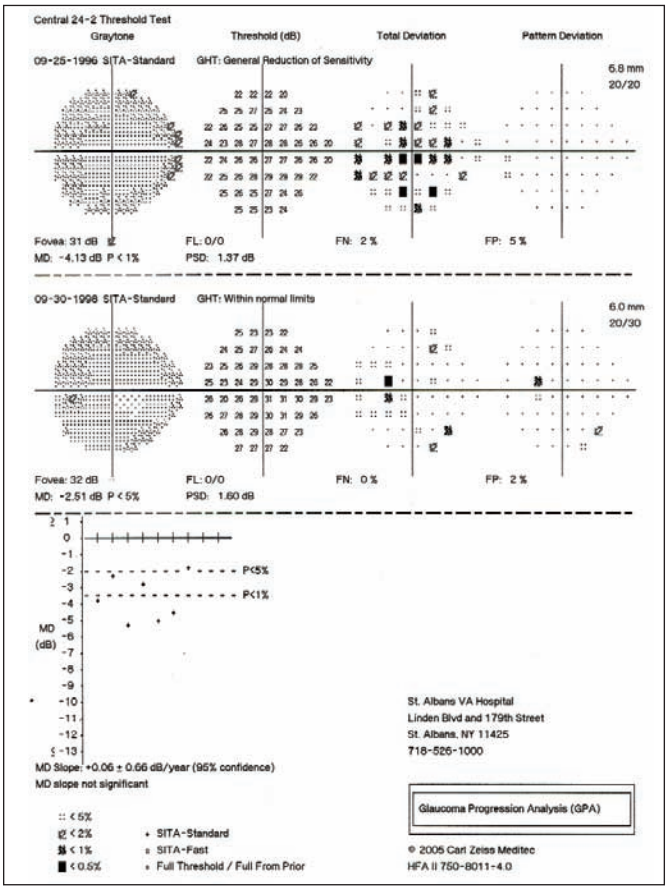

Figure 2B. OS

Five points in the lower field have now shown significant change in two successive fields, as compared to the baseline field, and the message, Possible Progression, is seen on the printout. The last field of this set for the right eye from 2003, confirms progression. Five points have shown significant change three fields in a row and one point has shown significant change in two consecutive fields. The message on the field reads Likely Progression, as based upon criteria developed for the Early Manifest Glaucoma Trial.

Of particular interest in this series of fields in the right eye is that with visual inspection, the number of points flagged does not appear to have changed from prior fields. What has changed is that the defect, while similar in size going back to 2001 has gotten denser or deeper. This is the reason why the progression analysis symbols are flagged.

The left eye's visual fields remained relatively full until 2002, at which time several points are flagged as getting worse for the first time. The field repeated in 2003, now shows the hallmarks of a superior partial arcuate scotoma developing. Only one point flagged in 2002 is repeatable though several other points are now flagged. The suspicion is that the left field is getting worse. This field needs to be repeated to confirm the change.

In summary, visual field progression has been confirmed for the right eye, with suspicious loss in the left eye. The therapeutic regimen for this particular patient needs to be reevaluated. The single field printout for the last field in the series (2003) (figure 5A, B) summarizes the data, alerting the clinician to the number of fields that have been done along with the dates. The box on the right side of the printout using the GPA symbols shows that in the right eye, several points have gotten progressively worse, and that Likely Progression has occurred. The left single field analysis (figure 5B) shows superior partial arcuate loss, possibly getting worse. Looking at the initial printout (figure 2A, the regression plots reveal that for the right eye the fields over the seven years of follow-up have changed 0.49 dB per year. The regression printout also shows that the fields were changing significantly until 2001 (as seen by the symbols getting lower and getting worse), with the last three points (for the last fields) being in a horizontal line indicating that the MD has stabilized. This may be due to the patient becoming more compliant with his medication. The regression plot for the left eye (figure 2B) shows the mean deviation unchanged from the baseline field, and actually improving +0.06 dB per year. Still though the MD slope has improved, a small scotoma has developed.

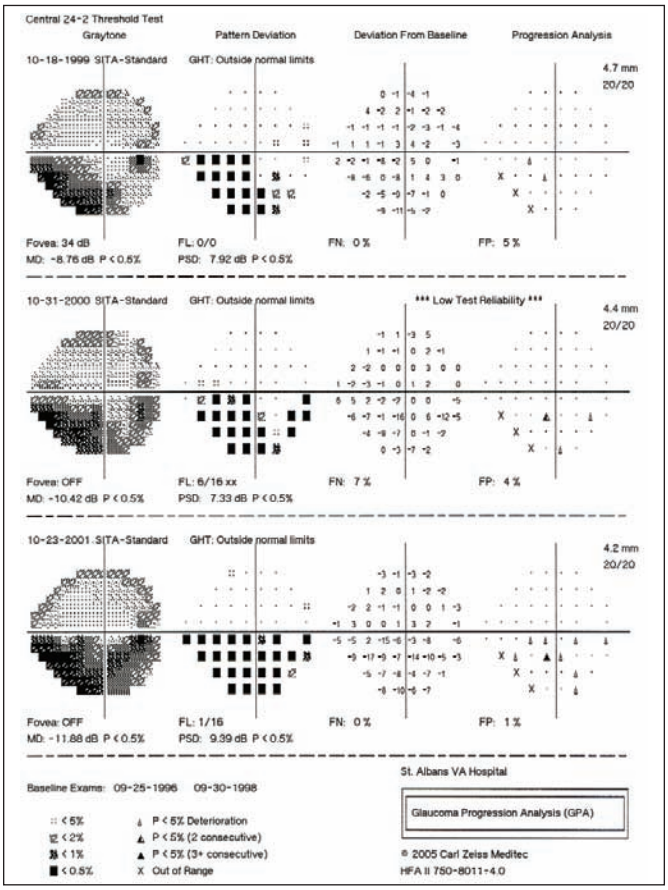

Figure 3A. OD

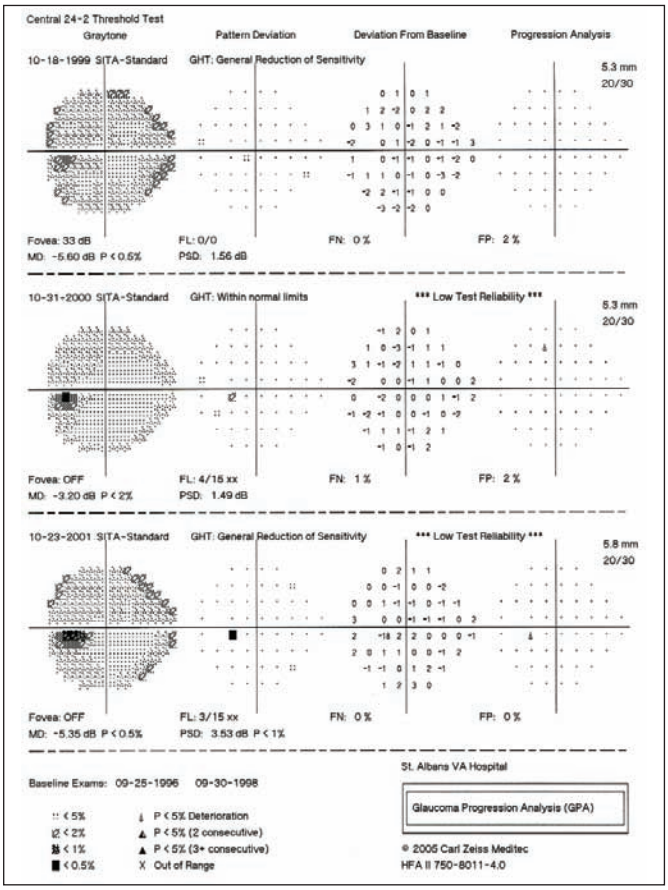

Figure 3B. OS

In this patient fields were done on a yearly basis, in large part because this has been the standard interval for testing. I have now modified the testing interval, performing visual fields on newly diagnosed patients on a six month basis for the first two years. The regression analysis component begins at five fields and allows analysis of change. If the fields are stable, the interval for field testing is modified to yearly. If progression is seen, the treatment regimen is reevaluated and fields are repeated on a six month basis. The general goal in treating glaucoma is to prevent visual disability, clinically indicating that we do not want the mean deviation of the visual fields to go below -15 dB. For this patient, the initial MD was approximately -9 dB in the right eye at the age of 70 years old. For the first five years, the MD slipped to almost -12 dB. This rate of loss was greater than -0.5 dB per year which would have put him the range of visual disability somewhere around the age of 80. Luckily, the right fields stabilized and little change has occurred recently. Another question related to this case is why therapy was not advanced sooner for the right eye. The answer is that these decisions were made before the GPA was available. Simple overview printouts showed the field to be relatively stable, and optic nerve assessment did not reveal any change.

This, then, is an example of how the Glaucoma Progression Analysis may be used to alert the clinician that progression may be occurring. In this example, probably the most difficult to detect form of visual field change is seen in the right eye as the scotoma is not getting larger but rather, getting denser. Still the GPA alerts the clinician to the worsening condition so that he/she may reevaluate the treatment regimen. In the left eye progression is more obvious as a clean field has developed a defect.

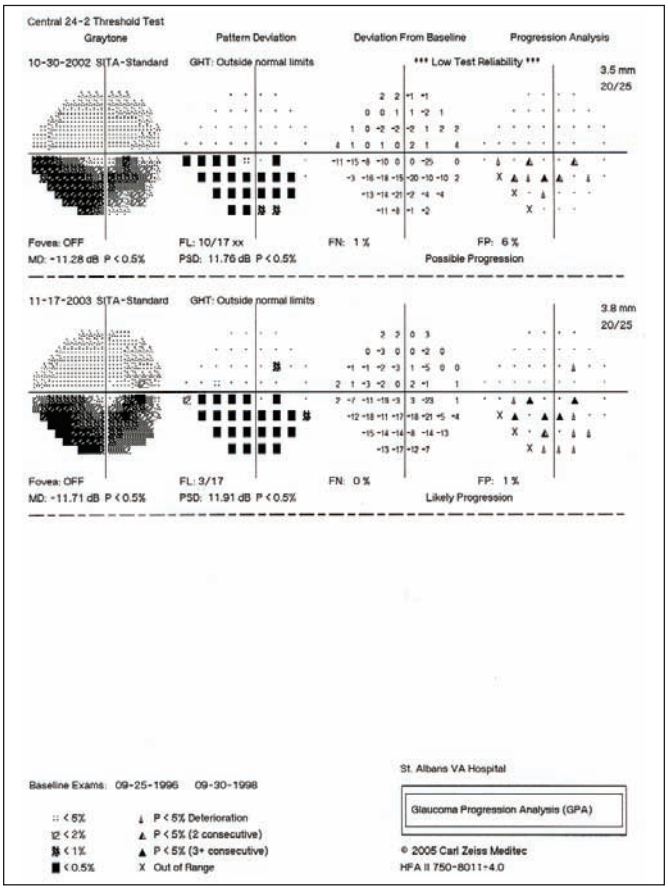

Figure 4A. OD

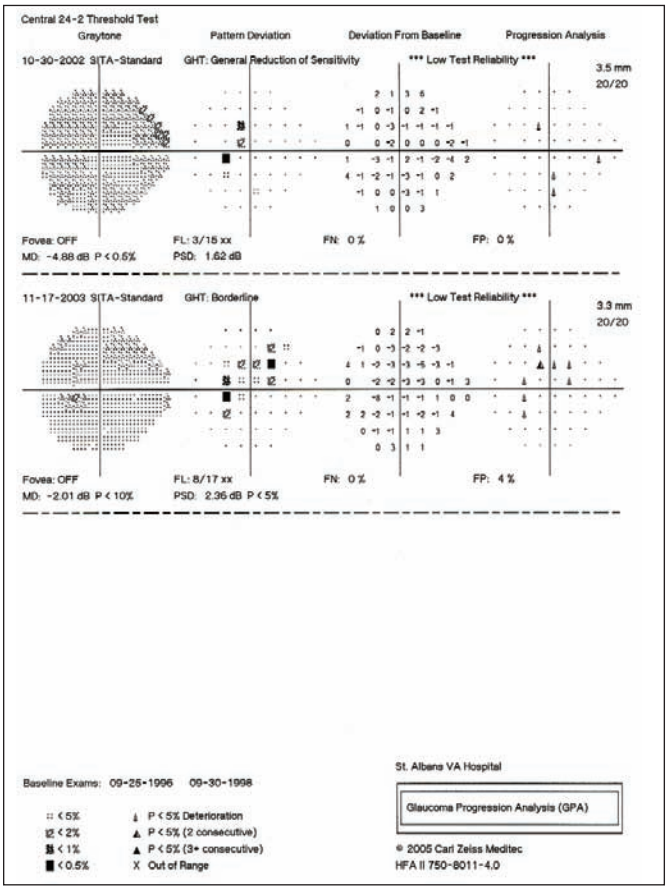

Figure 4B. OS

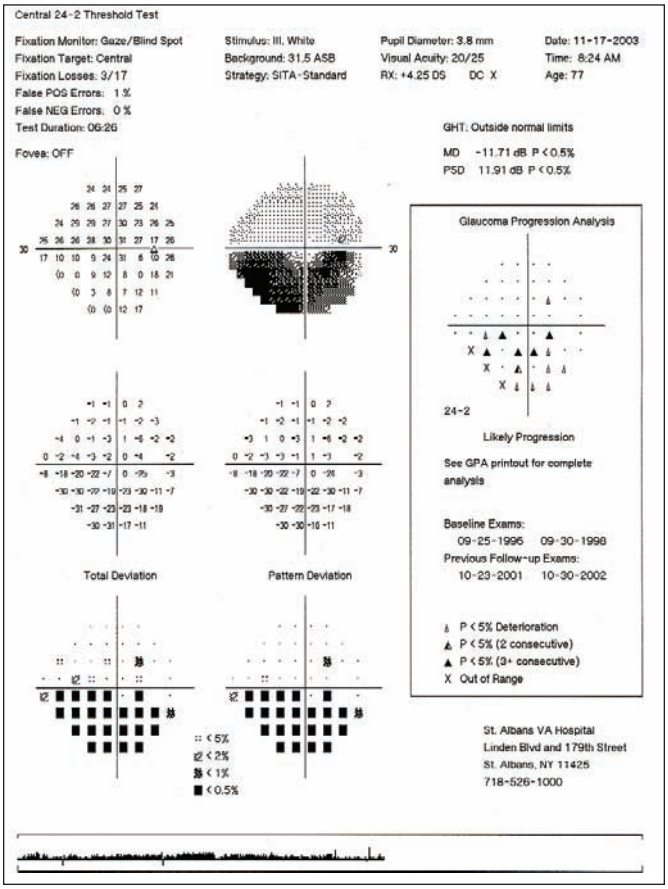

Figure 5A. OD

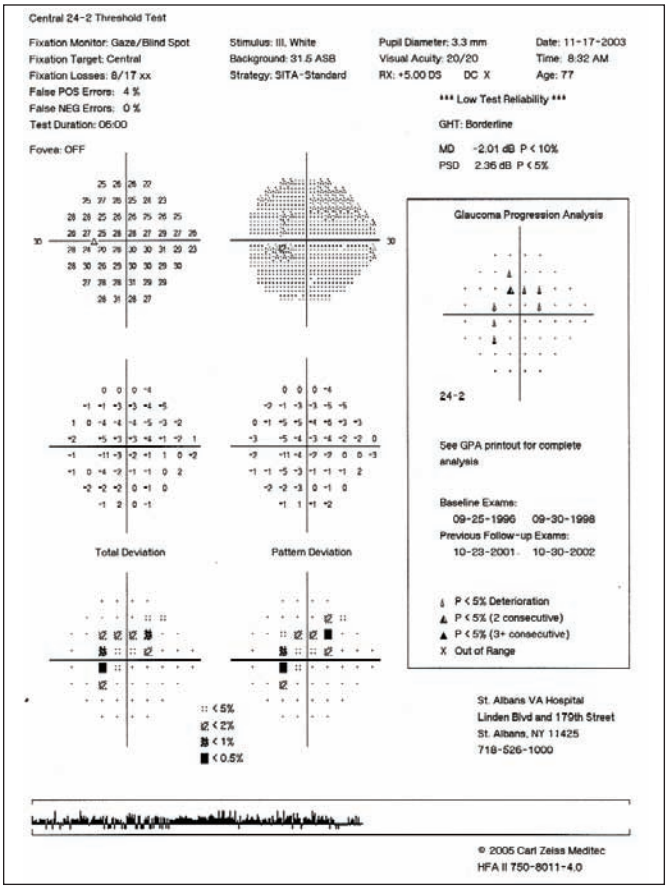

Figure 5B. OS