

Problems with Automated Field Testing

"The perimetrist should never allow the excellence of his apparatus to govern his interpretation of the results obtained."¹
Harry Moss Traquair

"there is no real substitute for the visual field examination conducted by the (practitioner) himself."²
David O. Harrington

There has been an explosion of interest in automated field testing over the past 10 years. Dozens of instruments³ are either on the market or at the prototype stage, and their costs (in 1981) ranged from US\$3000 to 100,000. Hundreds of articles have been written on this subject, mainly in the European and US journals. In order to help the practitioner achieve some sort of balanced view of these developments, I would like to offer my reasons for *not* using an automated field testing instrument.

1. Prevalence of Field Defects

There are few studies which describe the number of patients found with field losses in a general practice. Those studies which are available⁴ indicate that something less than 2% of people in a routine sample will have a field loss. Of this group, 70% of the field anomalies would have been predicted based upon other information obtained in a routine eye examination: causes included (in descending order of frequency) infective or traumatic retinal lesions, macular lesions, refractive scotomas, cataract, glaucoma, peripheral senile retinal degeneration, occlusion of the central retinal artery, and drusen of the optic nerve head. No etiology was established for the remaining 30% of the field losses.

It would be more productive to concentrate the study of visual fields on those patients who are likely to have a field loss, rather than screening everybody. The latter method consumes a lot of time and has the

potential of generating false negatives (although it will no doubt produce some true positives).

2. Nature of Field Defects

Field defects are frequently hard to find, even though you know they are present. They may also be transient. Finding a field defect requires use of appropriate tests (e.g. Amsler grid, tangent screen, or perimeter), appropriate stimuli (correct target size, brightness, color, rate of movement), and appropriate instructions to the patient (which will vary from patient to patient). It is usually necessary to concentrate the search in a particular portion of the visual field. Automated field testing (AFT) runs afoul of most of these considerations: most practitioners opt for a single AFT instrument, and thus are locked into a single type of test (e.g. Friedmann Field Analyser covers a 25° radius, while many others are built in a hemispherical format, with a 90° radius). Much AFT equipment uses stimuli in predetermined locations: often the same stimuli are used on all patients. This design feature makes it impossible (in many cases) to do a concentrated search in the area where the scotoma is thought to be. From a mathematical standpoint, moreover, it could be said that a single pass through the right meridian of the visual field tests not only *more* points, but *more useful points* than the whole battery of preplaced points in many AFT instruments.

While the idea of testing a *standardized* group of points in the visual field has a superficial appeal to

it, we should keep in mind that most visual field defects are notoriously capricious: it is unlikely that a rigidly standardized test would find them. Some of the more sophisticated AFT equipment will permit a concentrated search in an area of the field; however, it is unreasonable to expect even a programmable AFT instrument to duplicate the mental twists and turns executed by a practitioner whose suspicions have been aroused. Uncertain responses, which are often full of information for a clinician, will not be picked up by many AFT instruments.

3. Types of AFT equipment

The purpose of early types of AFT instruments was simply to divide (or screen) the patient population into those with field losses and those without. The next step was supposed to be an accurate, quantitative field assessment by the practitioner. The latter step has been taken less and less frequently in recent years, for two main reasons: first, the current generation of AFT equipment possesses considerable sophistication, so that the practitioner may expect it to produce truly quantitative, definitive plots of the field; second, many practitioners, once they have acquired a machine to liberate them from the tedium of field testing, come to depend on it for *all* testing, and do not do *any* further testing themselves.

4. Flow of examination

Ideally, all aspects of an examination should be interactive. Clues

arising at any point in the examination may prompt some sort of field test. Conversely, results of field testing may stimulate further consideration of ophthalmoscopy or case history. If the patient has been 'screened' for field defects, and if the result is negative, then the practitioner's index of suspicion will be reduced, and he/she may not give any further thought to any field testing. False negatives make this consideration even more distressing.

Conclusion

In today's world of high technology (especially computer technology), the arguments above have stimulated engineers and computer programmers to develop still larger and more expensive apparatus. I would like to question the basic premises behind development of automated field testing hardware/software. Those premises are:

1. It is a waste of time for a practitioner to test fields.
2. A machine, especially an expensive machine, can do it better.

The first premise is probably accepted by many practitioners because they haven't been finding any interesting field defects. I would suggest that this is because they haven't been testing the right people, using the right test, or considering the right part of the visual field.

The second premise has a more subtle origin. This century has seen tremendous technological advances. It is not surprising that many people have been conditioned to accept the notion that machines can do virtually anything better than people. Certainly a computer can manipulate data faster than a human can. The problem with the second premise is that the computer is not truly capable of *originating* ideas. Locating a visual field defect is similar to the process of any scientific discovery. In the early days of science, it was thought that if you collect *all* available information on a subject, a relation among the facts would become evident by itself: this is the deductive approach. Another method is to collect some information on the subject and think it over

for a while: you may gain some insight into it 'spontaneously': this is the inductive approach. Any honest practitioner will admit that there is an element of luck in solving some problems: sometimes there is a chance remark or a random observation which makes the diagnosis suddenly spring to mind. Such inductive leaps are precluded by the use of a machine: there is no program which describes intuition — even if there were, there is no computer which would be able to use such a program.

Reversing the preceding argument, I suggest that a field testing apparatus would be best suited to solving deductive-type problems — but these are the easiest kind to solve anyway. The automated field

testing instrument is most likely to fail when the problem becomes difficult: this is hardly what you would pay a lot of money for!

References

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LETTERS

Editor, C.J.O.

I would like to compliment the C.J.O. and the authors on the publication of "Chemical Components of Contact Lens Solutions." In my opinion it is a very well done paper and will be of great practical use in my practice. I am sure others will agree.

As a trustee of the Canadian Optometric Education Trust Fund, I am particularly gratified by the calibre and content of the paper. My thanks to all concerned.

Jack F. Huber, O.D.

Editor, C.J.O.

In the otherwise well-informed article by Lum and Lyle in your December issue, on the chemical components of contact lens solutions, comparison of costs for various solutions and regimens was undertaken. In this comparison, the basis for per cost estimate for enzyme cleaners used by the authors was 2 tablets or packets/week.

In the case of Clean-O-Gel this basis for calculation is not correct, since Clean-O-Gel only requires *one*

packet per week to clean both lenses, not one per lens as required by other enzyme cleaners. Using one packet per week for Clean-O-Gel would bring Lum and Lyle's estimated cost to \$2.38, making it the least expensive enzyme cleaner on the market.

Keith D. Gordon, Ph.D.
Director of Marketing
Alcon Canada Inc.



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