

Understanding Visual Fields, Part III; Which Field Should Be Performed?

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In this article, we will discuss the reasoning behind choosing one type of visual field over another, as well as one type of automated perimetry strategy versus another. The reader should keep in mind that the different tests overlap considerably. Therefore, more than one choice of visual field test may be appropriate in many cases. Also, some ordering physicians may simply be more comfortable interpreting one type of test versus another. Additionally, certain patients will perform better on one type of test than another. However, it is worthwhile to understand why one test is preferred when a choice is available. We offer our choices in this article based on the inherent advantages and disadvantages of each test or testing strategy. As in the previous two articles, Humphrey™ visual fields (HVF) will be described as examples of automated perimetry, with the understanding that other quality perimeters are also in use.

What do the HVF numbers mean?

As discussed in the previous articles in our series, the first number refers to the degrees of the field tested. For example a 10-2 means that the machine tests points 10° around the center vision (fovea). A 24-2 tests points 24° around the fovea. The second number refers to the testing protocol. The HVF has historically had two main testing protocols, 1 and 2. Protocol 1 tested points directly on the horizontal and vertical axis. Protocol 2 tests points on either side of the horizontal and vertical axis.¹ Since defects found right on the line can be difficult to interpret, everyone uses 2. Most currently used HVF machines do not operate 24-1 or 30-1 algorithms anymore.

Where in the eye do we expect to find pathology?

This is a main driving force behind choosing a test. For example, when we are screening a patient for Plaquenil™ toxicity, we are checking for damage to the macula. We do not expect to find damage in the peripheral retina. Therefore, testing 60 degrees away from fixation has little value. So, a Goldmann™ visual field (GVF), which tests the entire field, would not be ordered. Since the macula accounts for the central vision, we would order a HVF 10-2. This test only examines the central 10 degrees, hence the name. We could have ordered a HVF 24-2 or 30-2, since these also test the central 10 degrees. However, the 10-2 is a better choice since it tests more places inside the central 10 degrees than the other two tests. It can be thought of as showing a "magnified view" of the central retina.

Let's look at this in more detail. A HVF 24-2 and 30-2 will test 3 degrees from the horizontal and vertical meridian, then every 6 degrees after that (Figure 1).¹ A HVF 10-2 will test 1 degree from the horizontal and vertical meridian, then every 2 degrees

after that (Figure 2). Now look at the lesions in Figures one and two. You can see how lesions could be completely missed by the 24-2 and 30-2, even though the central 10 degrees is being tested.

Figure 1. The diagram on the left shows all points tested in a HVF 30-2. Note that points along the vertical and horizontal axis are 3 degrees from the line while all other points are spaced 6 degrees apart. The circle shows the central 10 degrees. The diagram on the right shows the points tested in the central 10 degrees in a HVF 24-2 and 30-2 (i.e. all points inside the circle). Notice that the lesion shown in blue is completely undetected by this field test. The print out would appear completely normal.

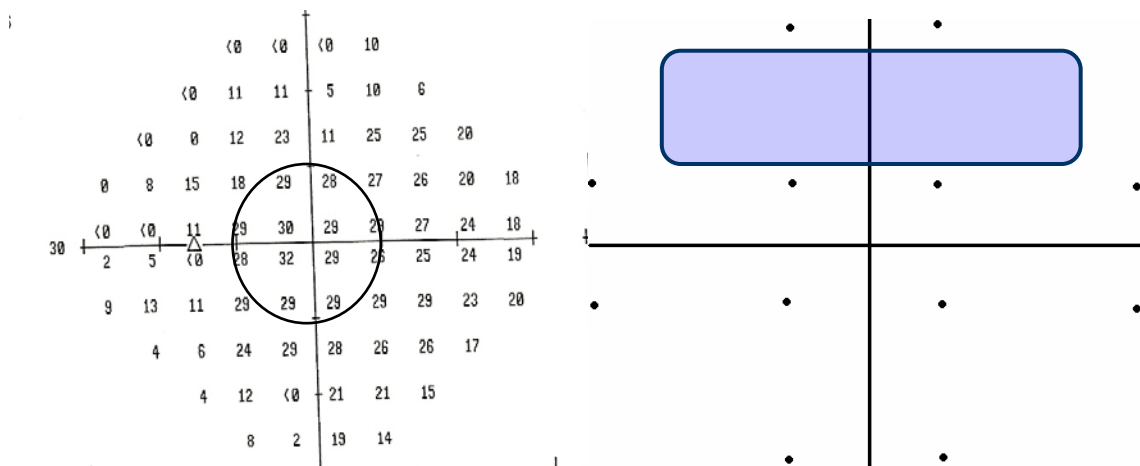
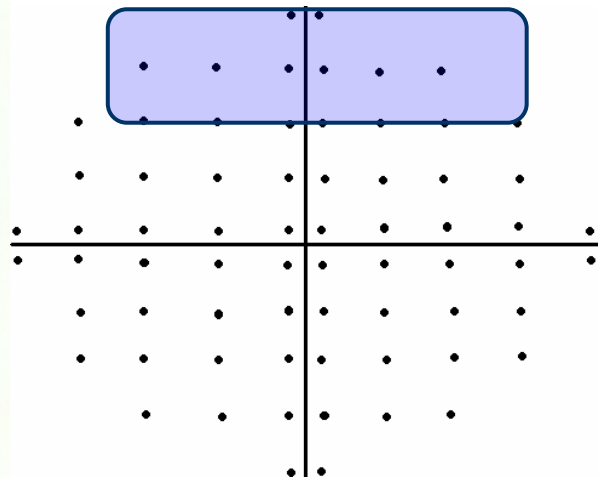
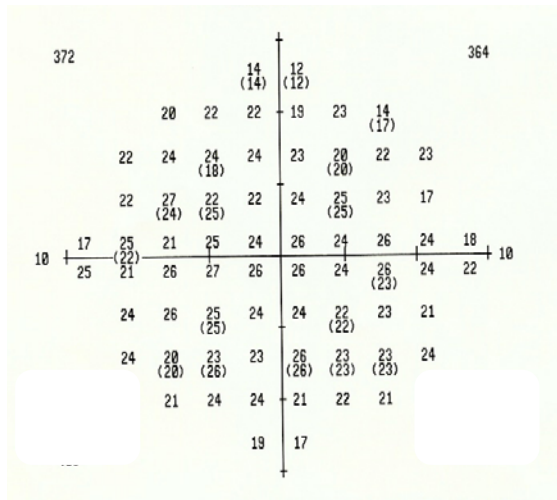


Figure 2. The diagram on the left shows all the points tested in a HVF 10-2. Note that points along the vertical and horizontal axis are 1 degree from the line while all other points are spaced 2 degrees apart. Notice in the diagram on the right that the same lesion from Figure 1 (shown in blue) would have been easily detected by this field test. The print out would have shown a defect involving 12 data points.



Are we screening for disease or looking for disease progression?

Although these questions may sound similar, they are quite different. When we screen for the presence of disease, we have many testing options since any damage found could be significant. Alternatively, when we know the patient already has a disease, such as glaucoma, we need to know if things are stable or getting worse. Therefore, we are limited to certain tests that can be compared to previous tests to look for any changes. Let's look at this with 2 examples.

Case 1. Mrs Smith is a new 58 year old patient to your clinic. Her exam is completely normal except that her cup to disc is 0.70 in both eyes. She reports having a sister with glaucoma. Which visual field test would be appropriate to run?

A. HVF or GVF?

A case could be made for either test. A GVF tests the entire visual field, is quick and is easier to take for most patients. However, most physicians would likely prefer a HVF in this case. A HVF gives more statistical data than a GVF, tests more points and is easier to compare to future HVFs. If Mrs Smith turned out to have difficulty with the HVF, then a GVF might then be attempted.

B. HVF 10-2, 24-2 or 30-2?

10-2 would not be appropriate since we need to evaluate farther out than 10 degrees. The difference between a 24-2 and a 30-2 is the extra row of points around the edge in the 30-2. Physicians vary in their preference between these 2 tests. A 30-2 gives more information with an extra row of points compared to a 24-2. It therefore tests more of the peripheral vision and may detect the edge of a visual field defect that might be missed by the 24-2. Some physicians also believe that the most peripheral row of points in a HVF are subject to problems such as lens rim or eyelid artifacts and are therefore unreliable. The most peripheral points in the 24-2 would be inside the most peripheral points in a 30-2 and would therefore be more believable. On the other hand, a 24-2 is quicker. Longer tests can cause patient fatigue and unreliable results. Previous studies have shown that a

24-2 can be as reliable a test as a 30-2 in glaucoma patients.² Some physicians prefer to start with a 30-2, and if this is normal, continue with a 24-2 for follow-ups. For our example, let's choose a HVF 24-2.

C. SITA™ or Full threshold?

The Humphrey Field Analyzer™ has screening options and threshold testing which are commonly used.³

Remember: The term “threshold” means that the intensity of the stimulus can be seen 50 % of the time.

SITA™ stands for Swedish interactive threshold algorithm and it is designed to decrease the amount of test time by incorporating a patient's responses in an intelligent way in real time. Threshold values are constantly calculated throughout the test at the same points. If the results are too different, those points are tested again. Therefore, the faster SITA™ protocols are generally preferred to full threshold testing to avoid patient fatigue.

D. SITA™-Fast (SF) or SITA™-Standard (SS)?

In SF, more variability is allowed between the repeated measurements, which allows for a faster test. In SS, only small differences are acceptable. Therefore, the machine continues to measure those points again and may take longer than a SF. Overall, SITA™ tests are much faster, taking 50% less time with SS and 70% less time with SF compared to a full-threshold test. So which one would be better for our patient? The SS might take a little longer, but would give the more reliable information. However, since we are screening for any hint of damage, the increased variability of the SF would also be acceptable. In this case, then we would order a HVF 24-2 SF. If the test came back completely normal, we would likely be satisfied that no glaucoma detectable by visual field testing was present. However, if defects had been found, we would then need to learn more. A more extensive test, such as a HVF 30-2 SS might then be performed. (It should be noted that some glaucoma experts prefer SS for screening instead of SF)

Case 2. Mrs. Smith's 62 year old sister is followed in your clinic for chronic open angle glaucoma. She has been followed for 4 years, but has missed several appointments and has not been seen in over a year. She also decided to stop taking her glaucoma drops several months ago. Her intraocular pressure is 26 in both eyes. In addition to restarting her drops, she needs a visual field test to evaluate for glaucoma progression. Which test should be performed?

Generally, we tend to order the same test that was performed in the past. This makes comparisons much easier. If she required GVF testing in the past, she likely requires it now. SF protocols would not be acceptable in this case due to the higher variability compared to SS. In checking for disease progression, every visual field point becomes important. It is no longer good enough to find any defect. We must find all defects possible and have a reliable measurement on them to compare for change. We would therefore order a HVF 30-2 SS (or a 24-2 SS if fatigue was a concern).

Why not test the full visual field with the HVF?

A HVF 60-4 measures from 30° to 60° at 68 points. If more peripheral field information is desired this test can be applied and the results combined with a 30-2. To test multiple points in the entire visual field would cause most patients fatigue. Most physicians therefore evaluate the central 30 or 24 degrees in order to have a more reliable test.

In summary, when looking for macular disease only, a HVF 10-2 is the best option. HVF 24-2 or 30-2 are usually first line choices when looking for disease in the peripheral field. When using a HVF, SF may be adequate for screening, but SS should be used to evaluate for disease progression. A GVF is a good choice for evaluating the entire visual field and in patients who have difficulty taking a HVF. This series has focused on the equipment and tests commonly used by the authors. We would like to emphasize again that other perimeters and testing strategies are appropriately and successfully used in other ophthalmology practices. The choice of test is usually influenced by the preference of the ordering physician and the equipment available. However, we felt it important to author this series to describe the rationale behind these choices.

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References

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