

How we should really be doing and interpreting the Ishihara

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On a typical clinical day, I (or my technologist) will evaluate a patient on hydroxychloroquine (Plaquenil™) or with a color vision complaint. So, I reach for the Ishihara book; have the patient put on their glasses and cover one eye. As I slowly turn the pages, the patient calls out the numbers. Everyone seems to be able to easily get the 1st plate (a number 12). When I get to plate #8 (a number 2), I tell the patient to just skip the plate beside it, because there really isn't anything on it. The next plate has a "16" and the adjacent plate has a squiggly line for illiterate or nonverbal patients, so my patient should just skip this one, too. Most patients can see the next 2 plates (numbers 35 and 96) and the last plate is another squiggly line, so that doesn't seem to be worth doing. As I record my results, I note the number correct over 11 for each eye separately (i.e. 8/11 and 6/11). I don't record it as 8/14 for the right eye and 6/14 for the left eye, since I skipped 3 plates. Then I look back at previous notes and see if this matches previous Ishihara testing or if a change has occurred.

I would guess that this scenario might sound familiar to many in our field. But is this "abbreviated" Ishihara acceptable? Can the test reveal more than just a comparison to the previous number of correct plates? What is the purpose of plate #9 (the one next to the number 2)?

History

The "Ishihara" is actually entitled, "Ishihara's Tests for Colour Deficiency".¹ It was created by Dr. Shinobu Ishihara (1879-1963), who was a Professor Emeritus at the University of Tokyo in Japan.² It was designed to detect congenital color deficiencies, which are commonly red-green defects.¹ The concise version of the Ishihara contains 14 plates.³

Background information you should know⁴

Each cone in the retina has one type of pigment: red, blue or green. The cones not only tell which color is being seen, but also the brightness or intensity of one color compared to another, specifically, red to green and blue to yellow. A red-green deficient person has difficulty telling red from green. This can be from an absence of red pigment (Protan), or it could be from an absence of green pigment (Deutan). Red-green color deficiency is common in men (5-8% of men, only 0.5% of women) because it is commonly a problem on the X chromosome (X-linked) and unlike women; men do not have a spare X chromosome.

Red- green color deficiency

A. Protanopia- loss or defective red pigment

B. Deuteranopia- loss or defective green pigment

Blue-yellow color deficiency

A. Tritanopia

Blue-yellow deficiency (Tritan) is very rarely congenital, and usually indicates an acquired disease. It is seen equally in men and women.⁴ In general, acquired diseases of the optic nerve cause a red-green problem, while acquired diseases of the retina cause blue-yellow problems. However, acquired diseases of the eye don't always follow this rule.⁵

It is important to understand that the Ishihara was **not** designed to detect blue-yellow defects.¹ It was designed to detect congenital red-green color deficiency. Therefore, if you test for an acquired disease of the retina (such as hydroxychloroquine toxicity), the Ishihara may or may not detect it. An alternative color vision test that includes blue-yellow testing should be considered (the *Hardy-Rand-Rittler* plates, for example).

How to interpret results ¹

Scoring occurs on the first 11 plates

10/11 is considered normal

7/11 or less is abnormal

Those scoring 8 or 9/11 need further testing to know

(Farnsworth Panel D-15 or Farnsworth-Munsell 100-hue test, for example)

What do the plates mean? ¹

Plates 2-11 are testing for color defects

Plate 1 is for explaining the test to the patient. Everyone (with very rare exception) should see plate 1.

In plates 2-5, red-green deficient patients may see different numbers. They should not see different numbers on plates 6-10, with the exception of plate #9. Plate #9 is special. Normal color vision does not allow you to see it, but a red-green deficient person can see a "2".

Plates 12-14 are for those with red-green deficiencies

These 3 plates help to differentiate between protanopia and deuteranopia. Patients with protanopia cannot see the first digit on plates 12 and 13 or the red line on plate 14, while those with deuteranopia cannot see the second digit on plates 12 and 13 or the purple line on plate 14.

TAKE HOME POINTS

The Ishihara detects Red-Green defects, not Blue-Yellow

Most congenital defects are Red-Green

Patients with Red-Green defects can see plate #9

If the patient scores 10 out of the first 11 plates, they are normal and you may stop the test

Acquired retinal diseases could be missed by the Ishihara

I encourage you to pick up your Ishihara, brush off the dust of the accompanying insert and look at the table on the last page.

References

1. Ishihara's Tests for Colour Deficiency, Concise edition. Kanehara Trading INC., Tokyo, Japan. 2006.
2. Shinobu Ishihara, From Wikipedia, the free encyclopedia
http://en.wikipedia.org/wiki/Shinobu_Ishihara. Accessed 1-27-09.
3. Measuring Colour Vision Defects, <http://www.geocities.com/HotSprings/8018/Measure.html> . Accessed 1-27-09.
4. Color Vision and Tests of color vision, Retina and Vitreous, American Academy of Ophthalmology Basic and Clinical Science Course, section 12, 2007-2008, p.43 and 195.
5. Martin,T and Corbett J. Neuro-ophthalmology; the requisites in Ophthalmology. Krachmer, J editor; Mosby, St Louis; 2000; p22.