HOW TO PERFORM KINETIC PERIMETRY

THE GOLDMANN PERIMETER: KINETIC VISUAL FIELD TESTING

Quantitative kinetic perimetry was developed in 1946 by Hans Goldmann and Haag-Streit[10] and was the standard of visual field testing prior to the invention of the first automated perimeter, the Octopus 201, in 1974.[11,12] Because of the flexible and adaptive properties of kinetic perimetry, the manual Goldmann perimeter (FIG 11-7) is still widely used and remains the reference for kinetic perimetry today.

THE GOLDMANN PERIMETER AND ITS SUCCESSOR, THE OCTOPUS 900

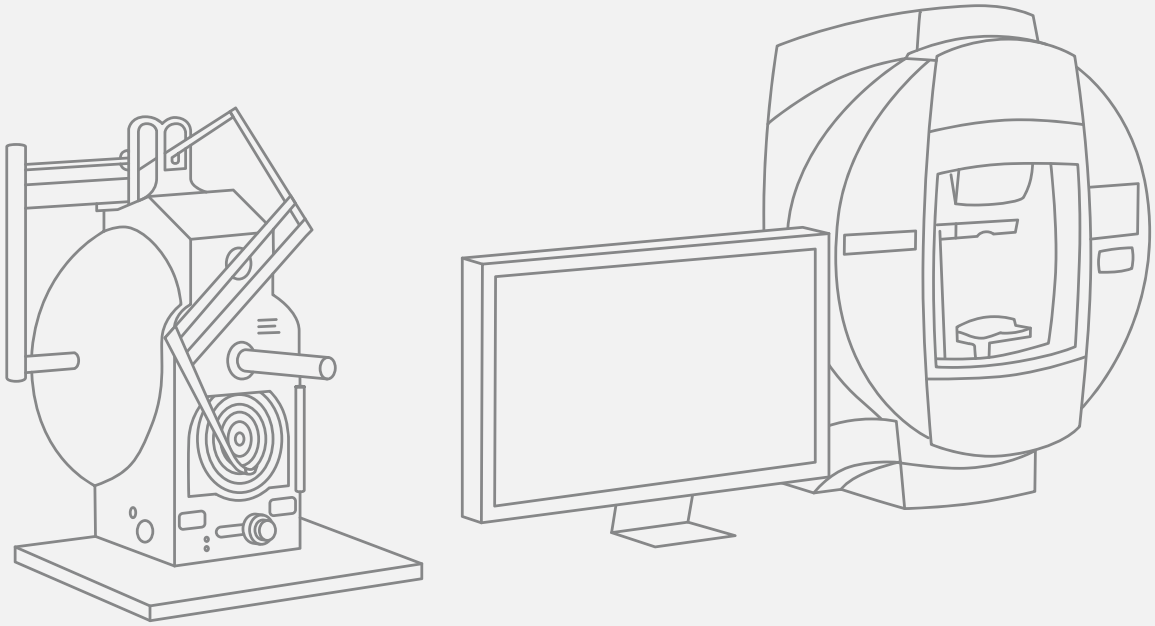


FIGURE 11-7 The Octopus perimeters (right) retain all the characteristics of the manual Goldmann perimeter (left).

To allow for continuity, the Octopus kinetic perimeter retains all the characteristics of the manual Goldmann perimeter including the same flexible and adaptive properties. It has been shown to be fully comparable to a manual Goldmann perimeter.[13-17] In addition, it provides standardized test conditions and semiautomation of kinetic perimetry to optimize clinical workflow and increase consistency of results among examiners and centers.

TABLE 11-2 summarizes the major differences and similarities between Octopus and Goldmann kinetic perimetries.

It is helpful to keep the legacy of manual Goldmann perimetry in mind because many definitions and uses stem from the time when the Goldmann perimeter was invented, and they are easier to understand when one is familiar with the manual Goldmann perimeter.

COMPARISON BETWEEN OCTOPUS KINETIC PERIMETRY AND GOLDMANN KINETIC PERIMETRY **TABLE 11-2**

	OCTOPUS KINETIC PERIMETRY	GOLDMANN KINETIC PERIMETRY
METHODOLOGY	Computer controlled stimulus presentation	Manual stimulus presentation
DESIGN	Goldmann bowl (radius = 30cm) Background illumination 31.4 asb (10 cd/m^2)	Goldmann bowl (radius = 30cm) Background illumination 31.4 asb (10 cd/m^2)
STIMULUS TYPES	Goldmann sizes I to V Intensities 1a to 4e	Goldmann sizes 0 to V Intensities 1a to 4e
STIMULUS SPEED	Fixed (1 – 10°/s) Manually guided	Manually guided
VECTOR TYPES	Guided vector Free-hand vector Static points	Straight Curvilinear Static points
INDIVIDUALIZATION & AUTOMATION	Full individualization Automation with added individualization Full automation	Full individualization
ADDITIONAL FEATURES	Reaction time compensation Normal isopter ranges	

KEY DECISIONS IN KINETIC PERIMETRY

As with static perimetry, a number of key questions need to be asked before starting a kinetic test and the answers will largely determine the results that one is able to achieve. These questions are similar to those asked for static perimetry, but are answered differently. These questions are:

- Which **stimulus type** should be used?
  - Which **stimulus size**?
  - Which **stimulus intensity**?
  - Which **stimulus speed**?
- Which **testing methodology** should be used?
  - What is the **trajectory of the vector**?
- Can some of the testing be **automated**?

STIMULUS TYPES

Similarly to the questions asked in static perimetry, the first question about stimulus type in kinetic perimetry has no clearly right or wrong answer. One can define standard testing methodologies for certain situations and follow them through for each patient.

In order to scan a patient's entire hill of vision, one needs more and less visible stimuli to be able to identify different isopters and scotomas. Stimuli can be made more visible by changing the stimulus size or intensity or by varying both together. For a normal visual field, the most visible stimuli lead to the largest isopters and the least visible stimuli lead to the smallest isopters. In FIG 11-8, common stimuli are shown that allow a thorough assessment of the full visual field.

NORMAL ISOPTERS FOR DIFFERENT STIMULUS TYPES

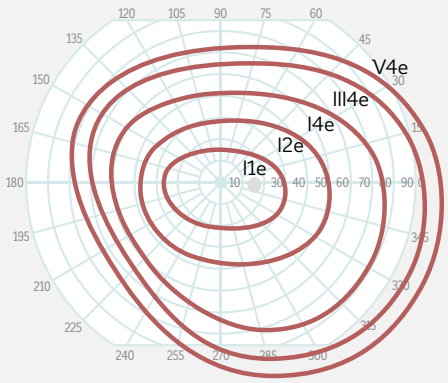


FIGURE 11-8 By using stimuli of different size and intensity, the hill of vision of a person with normal vision can be drawn. The III4e stimulus is larger and more intense and leads to a larger isopter than the smaller and dimmer I1e stimulus.

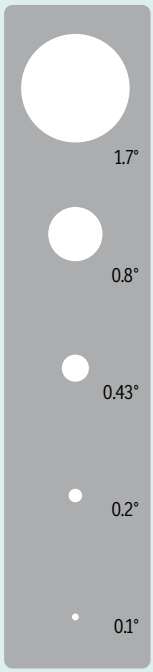
STIMULUS SIZE

Octopus kinetic perimetry uses five distinct stimulus sizes, Goldmann I to V, with Goldmann I being the smallest and each subsequent size being four times larger in area than the previous one as shown in TABLE 11-3. The sizes and naming scheme stem from the convention used by the manual Goldmann perimeter and were kept exactly the same to provide direct continuity.

While there is no standardized procedure for kinetic perimetry, and stimulus selection depends on the examiner and the patient, Goldmann sizes I to V at the highest intensity are commonly used to test the far and intermediate peripheral visual field. Goldmann sizes I and II combined with lower intensities are then used for the highly sensitive central area because the isopters of the larger stimuli III to V are detected outside of the central visual field in people with normal vision. Goldmann size I is also often used to map small or shallow scotomas that require high spatial resolution (e.g., the blind spot). Although size 0 is available on the Goldmann perimeter, it has not been included on the Octopus perimeter. This is because the size 0 stimulus is difficult to perceive through the optics of the eye, which can lead to unreliable and artefactual test results. The size 0 stimulus also has a limited dynamic range.

Goldmann V is the largest and most visible stimulus and is often used for low vision patients who cannot see smaller stimuli.

GOLDMANN STIMULUS SIZES I TO V TABLE 11-3

SIZE	DIAMETER	AREA [MM²]	RECOMMENDED FOR
V		64	Low vision (end stage disease) Far periphery (determination of anatomical visual field borders)
IV		16	
III		4	Periphery Standard for static testing
II		1	
I		0.25	Peripheral and central testing Small area and high resolution (e.g., blind spot, small or shallow scotomas)

STIMULUS INTENSITY

Stimulus intensities in Octopus kinetic perimetry range from 1a to 4e, with 1a being the dimmest and 4e being the brightest. A total of 20 distinct stimulus intensities are available, as shown in FIG 11-9. The naming convention for stimulus intensity stems from the manual Goldmann perimeter (BOX 11A). Because this scale is the accepted standard in kinetic perimetry, it is also incorporated into Octopus kinetic perimetry.

STIMULUS INTENSITIES IN KINETIC PERIMETRY

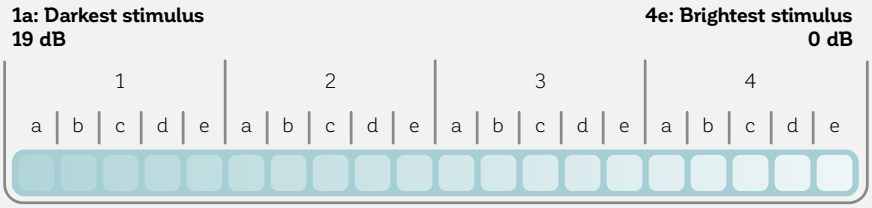


FIGURE 11-9 The intensities of the Goldmann stimuli used in kinetic perimetry are presented in 1 dB steps from the darkest 1a to the brightest 4e intensity.

As a rule, higher intensity stimuli such as the 4e are used for peripheral testing and dimmer stimuli such as the 1e are used for central testing. Using stimuli with very similar intensities adds little diagnostic information because their isopters are very close to each other and would clutter the picture and represent a generally poor trade-off between test duration and information gained. Thus, stimuli with several dB differences in intensity (3 to 5 dB) are usually chosen. When mapping absolute defects (i.e., areas of blindness), none of the stimuli are visible to the patient. Then, the brightest 4e stimulus can be selected, as it is the easiest for the patient to see and possibly respond to at the borders of the defect. When there is a wide separation between contour lines (isopters or scotomas), intermediate stimulus intensities can be selected to test the region between the isopters.

BOX 11A

THE ORIGIN OF THE STIMULUS INTENSITY SCALE

The manual Goldmann perimeter only contains one bright light source. In order to generate dimmer stimuli, filters are placed in front of the light source, making the stimulus dimmer.

There are two sets of filters. Filters a, b, c, d and e dim the stimulus by 1 dB, and filters 1, 2, 3 and 4 dim it by 5 dB. In combination, 20 different stimuli can be produced, with the brightest, 4e, representing a maximum stimulus brightness of 1,000 asb (315 cd/m^2).

STIMULUS SPEED

Each stimulus for Octopus kinetic perimetry moves at a constant speed to allow for reproducible results. The stimulus speed should be selected to optimize the trade-off between accuracy and test duration. While the influence of patient reaction time is smaller for a slower stimulus, the longer testing time can result in fatigue. In such cases, using a stimulus that moves faster leads to more reproducible results.

As a rule, stimulus velocities of 3–5°/s have been shown to optimize the trade-offs among accuracy, reliability and efficiency[13,18] and are recommended as a standard setting. For small scotomas such as the blind spot, slower stimuli of 2–3°/s are recommended as the clinically relevant spatial changes are small and are more accurately mapped with a slower stimulus.

GENERAL TESTING METHODOLOGIES

Finding the adequate testing methodology for any patient is a process that requires an experienced examiner who can adapt to the patient's responses. Consulting a textbook focusing specifically on kinetic perimetry[19-21] is recommended for guidance. In addition, obtaining instruction and advice from a colleague highly experienced in performing this procedure is highly recommended.

The next sections will illustrate key concepts of kinetic perimetry as a starting point for beginners, but are insufficient to attain high proficiency in kinetic perimetry.

IDENTIFICATION OF NORMAL ISOPTER LOCATION AND SHAPE

For each stimulus size and intensity, Octopus kinetic perimetry automatically provides the age-matched normal isopter location as a reference. The inner dark central band represents 25–75% of age-matched normals; the outer light band denotes 5–95% of age-matched healthy normals, as shown in FIG 11-10.

These zones support at-a-glance identification of deviations from normal and are especially helpful in interpreting central visual field defects and generalized diffuse or widespread loss. As the hill of vision is rather flat from the mid-periphery to the macula, those isopter locations are significantly influenced by age and only comparison to age-matched normative data will allow correct interpretation of the results. As the hill of vision is rather steep towards the far periphery, large age-related sensitivity changes have only a small influence on isopter location.[21-23]

In practical terms, the normal isopter location provides guidance on where to start placing vectors. Placing vectors far outside of a normal isopter would only waste time, as the patient cannot see the stimuli in these areas. Conversely, starting too near the anticipated location of detection can make the patient unprepared to respond and can produce untrustworthy results.

NORMAL ISOPTERS

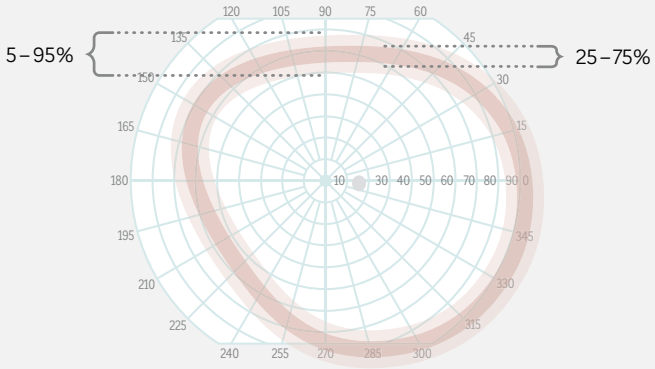


FIGURE 11-10 The normal isopters provide guidance on where to start a vector of a given intensity. They also serve as a guide in judging whether an isopter is normal. The dark red band represents 25–75% of healthy normals; the outer light red band represents 5–95% of healthy normals of the same age. Note that the isopters are not round, but egg-shaped. They extend farthest in the inferior temporal visual field and least in the superior nasal visual field.

MAPPING THE OUTLINE OF THE HILL OF VISION

The overall outline of the hill of vision provides valuable information about a patient's visual field because deviations from normal isopter shapes indicate abnormal visual fields. Thus, mapping the outline of the hill of vision is usually the first step in kinetic perimetric testing. To map the outline of the hill of vision, stimuli are moved from the peripheral end of the normal band towards the center (fixation) along a given radial meridian. By repeating this procedure with different stimulus types, the outline of the hill of vision can be drawn in detail, as shown in FIG 11-11.

This procedure is a fast and easy way to identify quadrantanopia and hemianopia, as the isopter will dip in the affected area of the visual field. As a general rule, stimuli should not move directly along the horizontal or vertical meridians, because inconsistent results will be obtained. This is because the boundaries of quadrantanopia and hemianopia are typically positioned along the horizontal and vertical meridians and a stimulus moving along these meridians cannot map them clearly. Glaucomatous deficits along the nasal horizontal meridian (e.g,. nasal steps and arcuate scotomas) represent another example where the stimulus should not be moved along the horizontal meridian. Thus, for these conditions, the radial vectors are best placed with an offset of a few degrees and possibly parallel to the horizontal and vertical meridians.

MAPPING THE OUTLINE OF THE HILL OF VISION

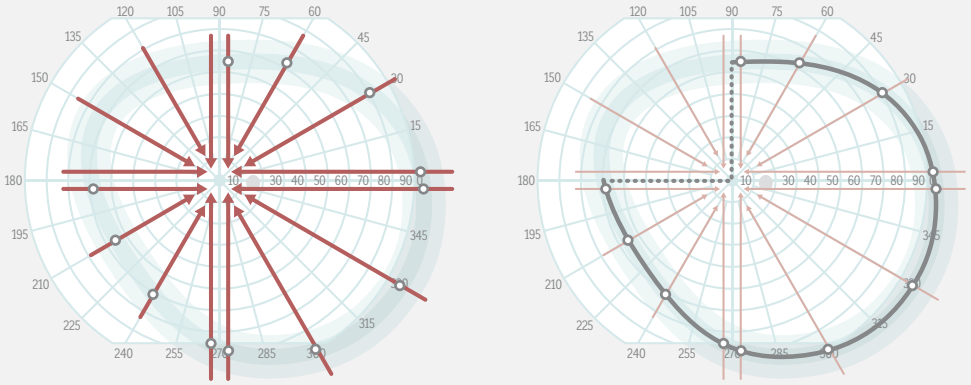


FIGURE 11-11 Superior-nasal quadrantanopia identified with radial vectors along meridians. Note that the vectors along the horizontal and vertical midlines are placed parallel to them to allow for better detection of the boundaries of the visual loss in that quadrant. There are no responses in the superior nasal quadrant of this right eye, indicating the quadrantanopia.

DETAILING THE BOUNDARIES OF AN ISOPTER

As with any contour or topographic map, the hill of vision may have crevices or depressions, which represent relative or absolute scotomas. As shown in FIG 11-11, these defects may not be identified with standard vectors moving from the periphery to the center. This is where customized individual assessment is needed. The examiner has to identify where there is a lack of normal response, which either manifests as inconsistent with adjacent vectors or outside of the expected normal sensitivity, which requires further investigation.

Conceptually, the process is always the same. When alerted to a potential abnormal isopter shape, the operator should estimate where the isopter is likely to be. To verify

that this isopter is correct, additional vectors are drawn perpendicular to the anticipated boundary of the isopter, as shown in FIG 11-12. The perpendicular vectors optimize the likelihood that the hill of vision will be met "head-on", which will reduce variability and provide more clinically meaningful information. Before initiating this process, it is important to recheck the abnormal isopter shape to confirm that it is outside of the normal expected responses.

If the patient response is as expected on the imagined isopter, the isopter shape is confirmed and can be drawn. If not, the procedure has to be repeated, taking into account the new information until the isopter location is confirmed.

DETAILING THE BOUNDARIES OF AN ISOPTER

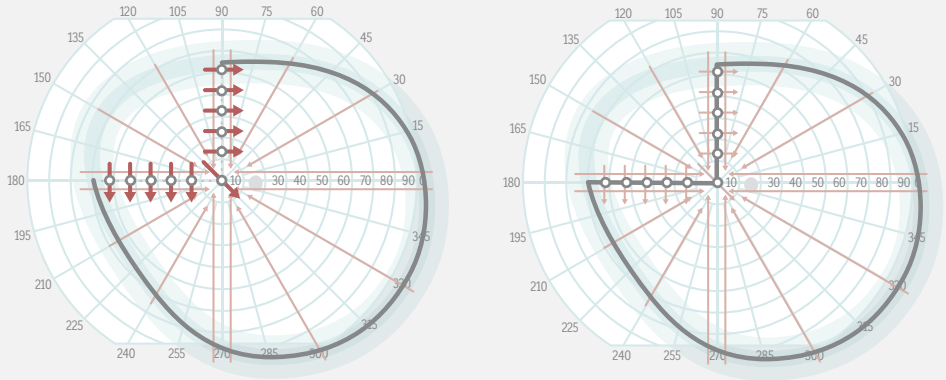


FIGURE 11-12 Procedure for detailing the boundaries of abnormal isopters on a superior-nasal quadrantanopia. The lack of normal responses allows the examiner to estimate the location of the isopter (dotted gray line), and then test using perpendicular vectors (bold red) crossing that line to confirm the shape of the true isopter.

IDENTIFICATION OF ISOLATED SCOTOMAS

While the procedure shown in FIG 11-12 allows identification of the outline of the hill of vision, it usually misses isolated absolute defects or local depressions located inside of an isopter or between isopters. In keeping with the analogy of a hill, isolated defects can be thought of as lakes or depressions of different shapes and depths. In order to identify these defects, spot-checking inside the hill of vision must be performed. Spot-checking quickly examines locations between isopters using static points of the same size and intensity as the outer isopter, to find possible areas of sensitivity loss (areas of non-seeing or scotomas). This allows for quick identification of scotomas as shown in FIG 11-13.

If areas of defects are identified, their boundaries can be mapped by moving radial stimuli from inside of the defects from the center towards its edges. This procedure can be repeated with stimuli of different visibility to define the slope and depth of the defect.

IDENTIFICATION OF ISOLATED SCOTOMAS

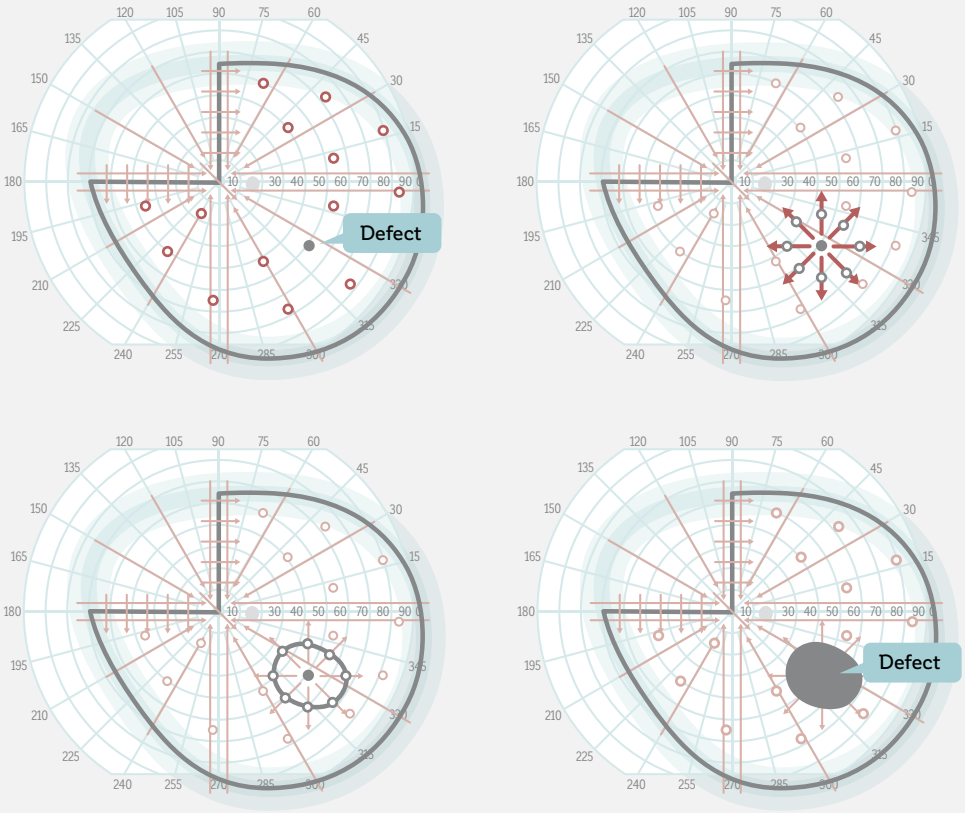


FIGURE 11-13 By placing a static point of the same intensity inside of an isopter or between isopters (spot checking, red circles), one can identify local defects that would otherwise be missed (no response, gray circle). Using radial vectors (bold red lines) from the center of the area of non-seeing (from the inside) to the area of seeing (to the outside) allows drawing the boundaries (gray bold line) of the defect in detail. For ease of reading, the defect should be filled with the appropriate color.

MAPPING THE HILL OF VISION USING SEVERAL STIMULUS TYPES

By repeating the procedures described in the previous sections using different stimulus types with different sizes and intensities, several isopters can be drawn to characterize the patient's entire hill of vision. There are many tips and tricks to make this procedure efficient. A few of them are presented here.

When drawing a second isopter, placing the vectors of the second isopter with a radial offset to the ones used in the first isopter is recommended, as seen in **FIG 11-14**. In other words, the vectors used to determine the second isopter should be placed at different locations than those used to determine the first isopter. This increases the chance of identifying an unnatural isopter shape without having to use extra vectors.

When spot checking to identify local areas of depression, the size and intensity of the outer isopter should be used between the outer and the inner isopters (**FIG 11-14**). Then, only the size and intensity of the inner isopter should be used farther towards the center.

It is also important to remember that there may be more than one isopter for the same stimulus size and intensity. There may be a region of detecting the target in the far periphery, with an area of non-seeing closer to fixation,

followed by a second area that can detect the target. This can occur in some cases of retinal disease, moderate to advanced glaucoma, and neurologic disorders affecting the visual pathways. Because of this, it is important to make good use of spot checking and evaluate the entire visual field.

PLACEMENT OF VECTORS AND STATIC POINTS USING DIFFERENT STIMULUS TYPES

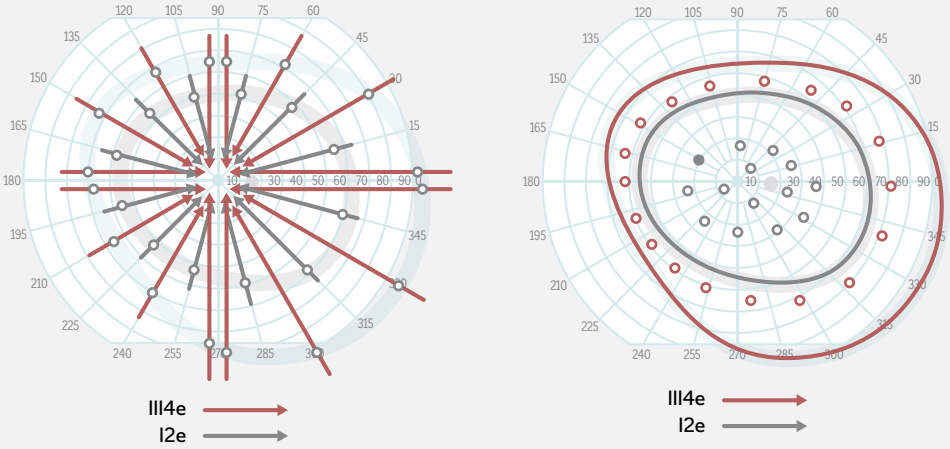


FIGURE 11-14 Vectors of different stimulus sizes and intensities are best placed with an offset to increase the chance of identification of abnormal isopter shapes. When placing static points between two isopters, always use the intensity of the more visible outer isopter.

Local scotomas can be absolute defects with sharp-edged boundaries such as the blind spot or relative defects with a gentle slope on the edge of the defect as in glaucoma. To distinguish between the two, more than one stimulus is needed to characterize a local scotoma as can be seen in FIG 11-15. For easy interpretation, these local depressions are typically filled with color to indicate that the corresponding stimulus cannot be seen within that visual field area.

DISTINCTION BETWEEN ABSOLUTE AND RELATIVE SCOTOMAS

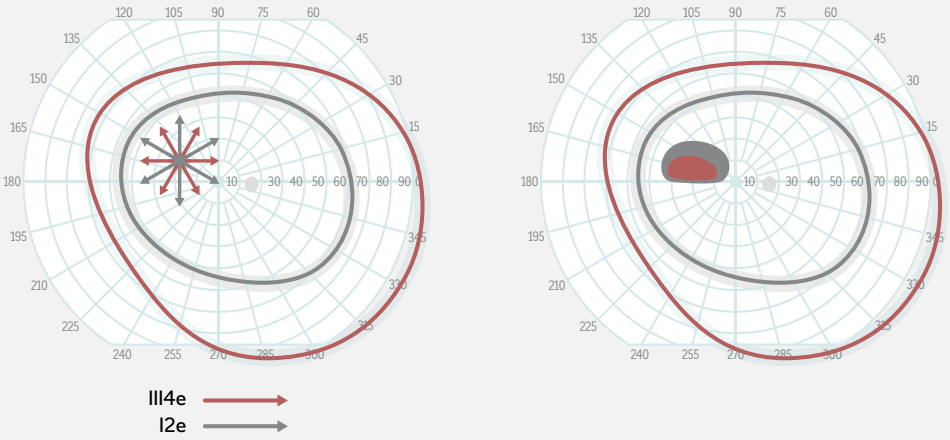


FIGURE 11-15 More than one isopter is needed to distinguish between absolute and relative scotomas. This example shows a nasal step for a glaucoma patient.

CHECKING FOR VISUAL FIELD RELIABILITY

Like static visual field testing, kinetic perimetry has a patient-related subjective component and the reliability of the results largely depends on good patient cooperation and minimizing variability due to learning or fatigue effects.[22,24,25] Therefore, it is also essential to check for patient reliability in kinetic perimetry. While static perimetry uses global indices such as false positive and false negative catch trials and short-term fluctuation, kinetic perimetry employs other methodologies to test for similar reliability indicators.

To assess short-term fluctuation, it is worth duplicating certain vectors to check for consistency of responses, as shown in FIG 11-16. To do this, two vectors should be placed as close together as possible (or repeated) and then compared for consistency. If the responses are reliable, the two patient responses should be very close together, as shown in the figure below to the left which means there is low test-retest variability. If they are separated, as in the example below to the right, it indicates an unreliable result with high test-retest variability. This procedure provides a good indicator for the quality of the results. Similarly, spot checking can be repeated at various locations to assess response consistency.

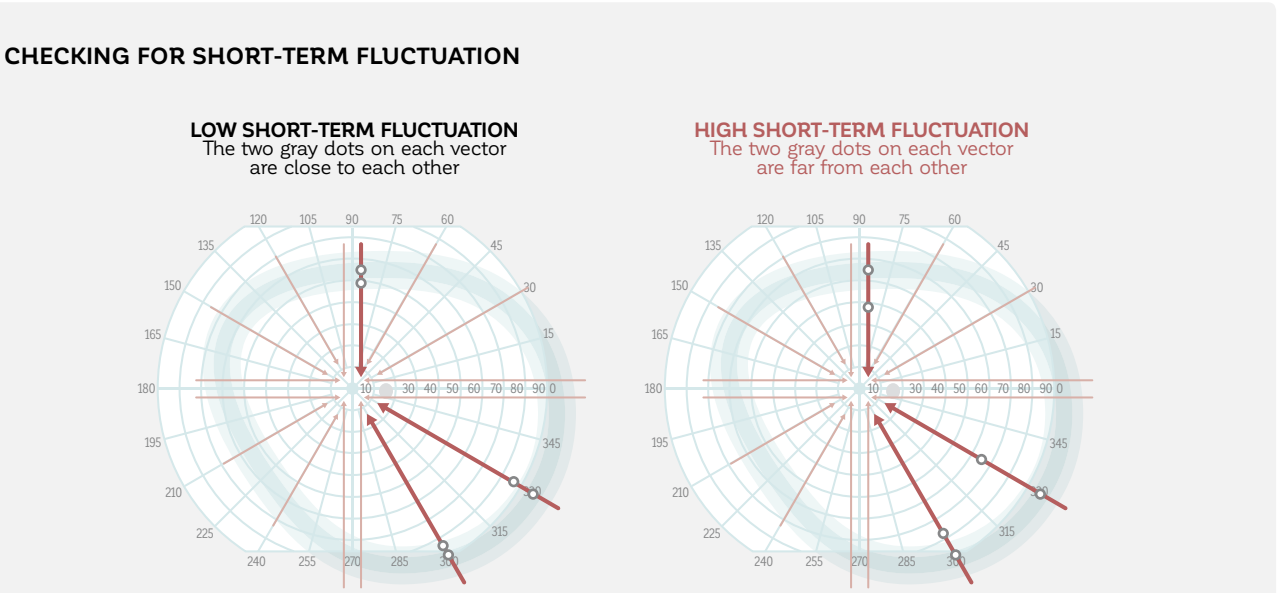


FIGURE 11-16 By repeating some vectors, short-term fluctuation and thus test-retest variability can be assessed. If the responses are close together (left), it indicates good patient cooperation, good repeatability and high reliability. If the responses largely differ (right), it indicates an unreliable visual field.

In legal driving and blindness examinations performed with kinetic perimetry, it is worth checking for false answers to identify patients who may simulate responses or a lack of response (functional changes or visual measures that are non-physiologic and non-pathologic). This can produce visual field results that are either better or worse than the actual visual field sensitivity profile. As in static perimetry, it is possible to check for both false positive and false negative answers even though the procedure is different. Checking for false positive answers can be easily done by presenting stimuli outside of the normal isopter area (FIG 11-17). By definition, the patient is not supposed to see these stimuli. If there are many positive responses, this is a strong indicator of a patient who is malingering.

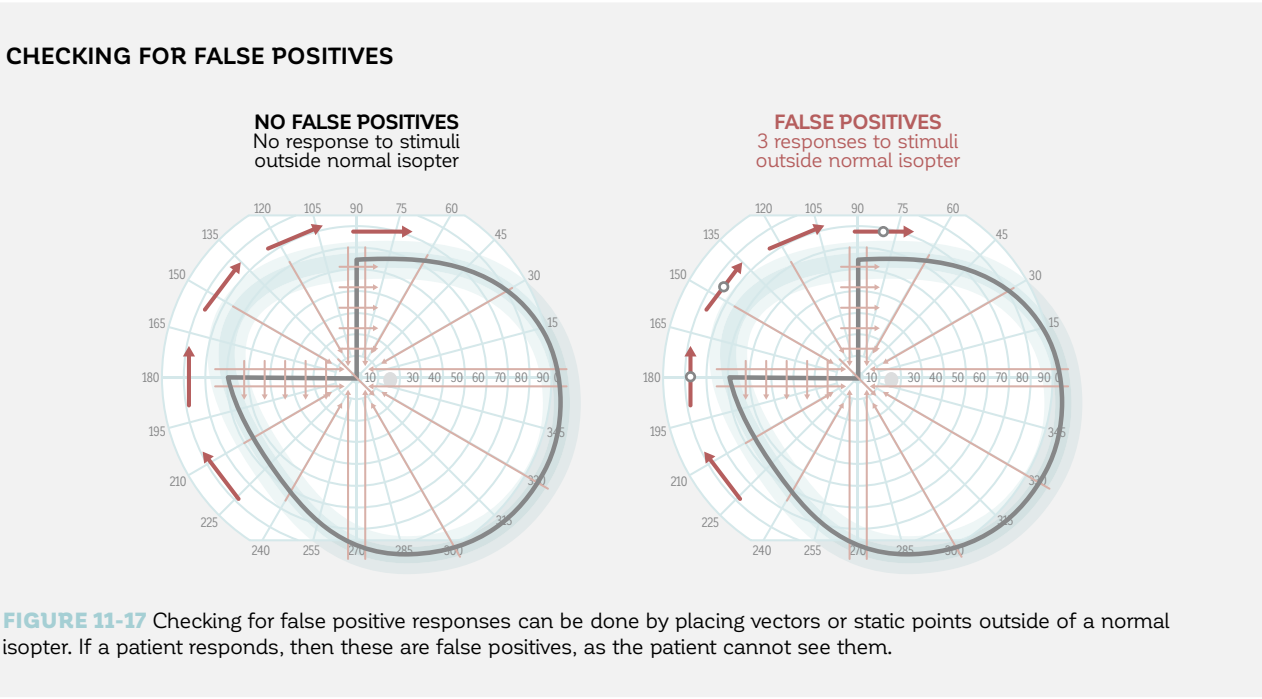


FIGURE 11-17 Checking for false positive responses can be done by placing vectors or static points outside of a normal isopter. If a patient responds, then these are false positives, as the patient cannot see them.

To detect false negative answers one places a more intense or larger stimulus at a location where the stimulus was previously detected. This stimulus should be easy for the patient to observe (FIG 11-18). Failure to see a more intense or larger stimulus than the one that was detected at threshold is considered to be a false negative response.

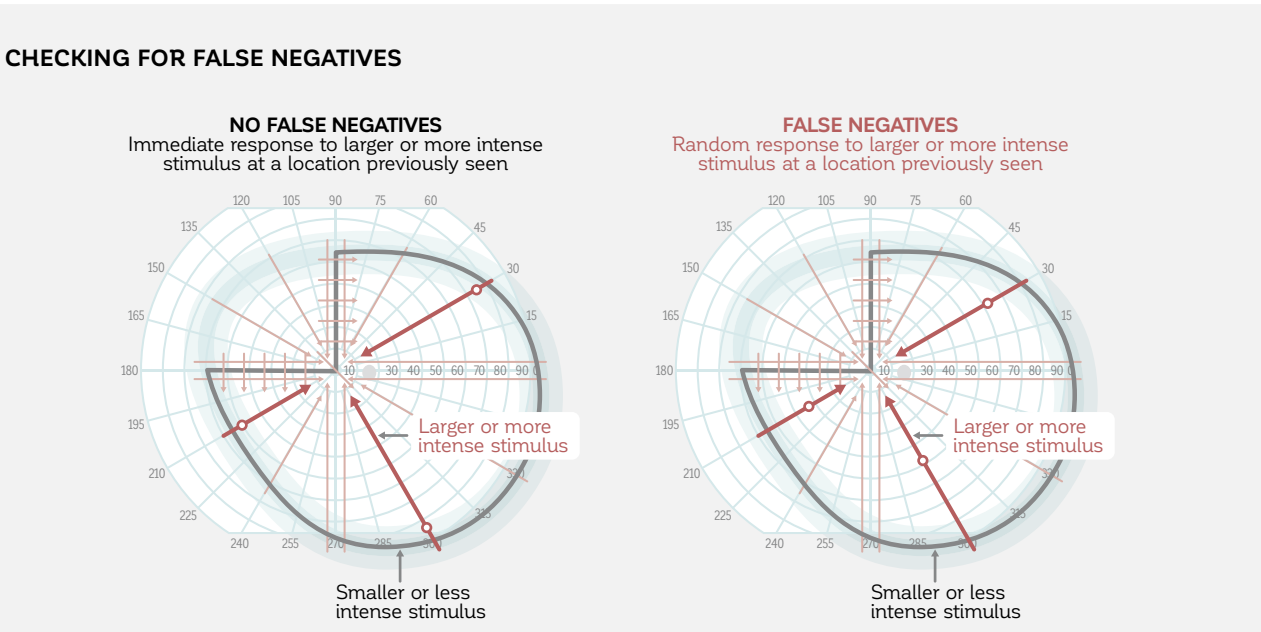


FIGURE 11-18 Checking for false negative responses can be done by placing larger or more intense vectors or static points at a location where a smaller or less intense stimulus was previously detected. If a patient does not respond, then these are false negatives, as the patient should be able to see them.

PATIENT REACTION TIME COMPENSATION

Patient reaction time influences the size of an isopter as the patient's response is produced some time after the stimulus is actually seen.[22,23,26] This also adds significant variability to the test procedure.[24] If a patient's responses were always instantaneous, outlines of the hill of vision would be larger and isolated defects would be smaller than they appear on the printout. This makes the interpretation of results challenging, especially in patients with long or inconsistent reaction times.

For this reason, Octopus kinetic perimetry offers the possibility of adjusting for patient reaction time by measuring its magnitude in the patient's intact visual field and applying a reaction time correction for it, as illustrated in FIG 11-19. In order to do so, the examiner should choose a reaction time vector of the same stimulus type as the isopter and place it into the patient's seeing area. The patient should be able to see the stimulus immediately as it is presented. Thus, the time between stimulus presentation and when the patient presses the response button represents the patient's reaction time.

PATIENT REACTION TIME COMPENSATION

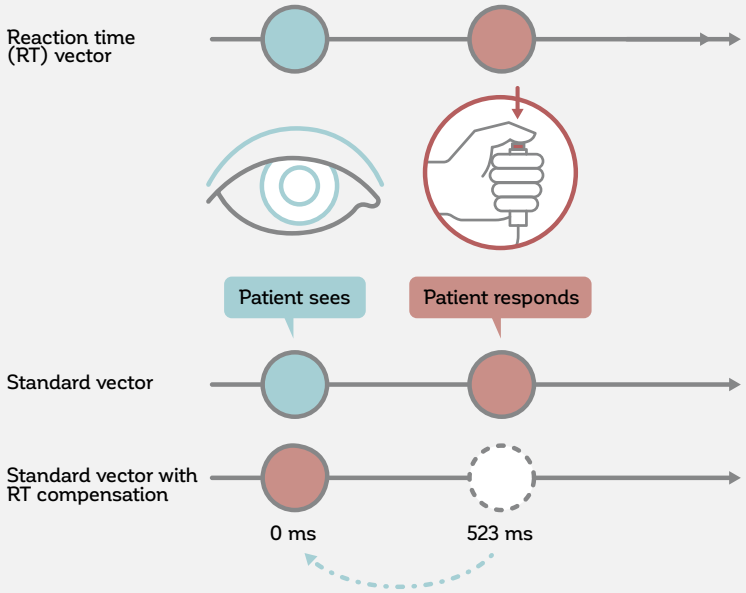


FIGURE 11-19 There is always a lag between the moment the patient sees a stimulus and the moment a patient presses the response button. This constitutes the patient's reaction time. By placing reaction time (RT) vectors into the patient's seeing area, one can account for this lag.

For a precise measurement of patient reaction time, using the average reaction time obtained from two or three different vectors for each stimulus type is recommended, placing the reaction time vectors close to the corresponding isopter. FIG 11-20 provides an example of the clinical usefulness of reaction time compensation.

EXAMPLE OF THE CLINICAL USEFULNESS OF REACTION TIME COMPENSATION

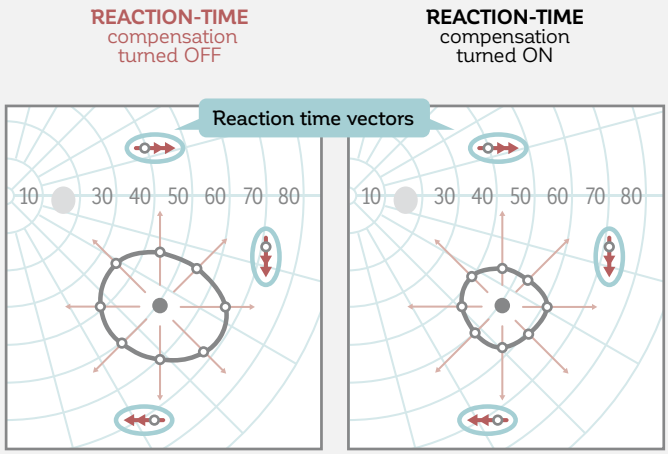


FIGURE 11-20 Without reaction time compensation, local depressions look uncharacteristically large (left). By using reaction time vectors (bold red, double arrows) to determine the patient's reaction time and by turning reaction time compensation on (right), the patient's adjusted defect size is revealed.

STEP-BY-STEP EXAMPLE OF KINETIC PERIMETRY

A real-life example of a complete kinetic test as performed in clinical practices is provided in **FIG 11-21**.

STEP-BY-STEP EXAMPLE OF A KINETIC TEST WITH SEVERAL ISOPTERS (STEPS 1-2)

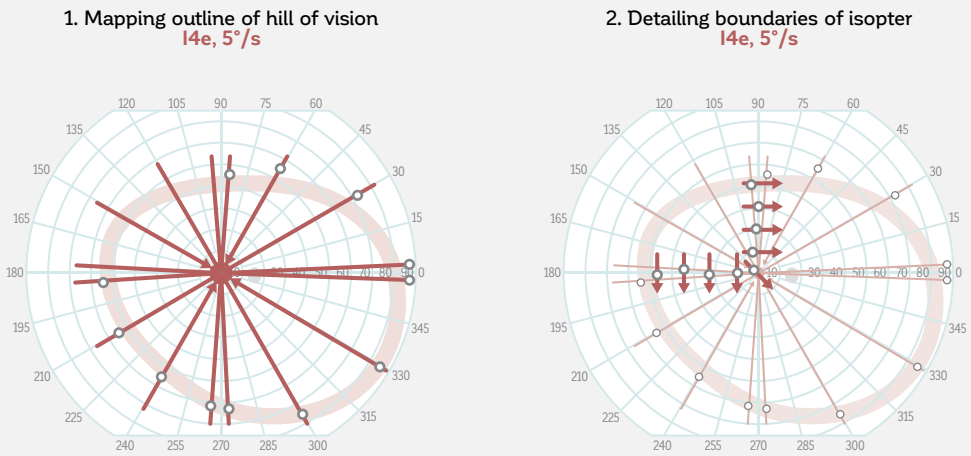
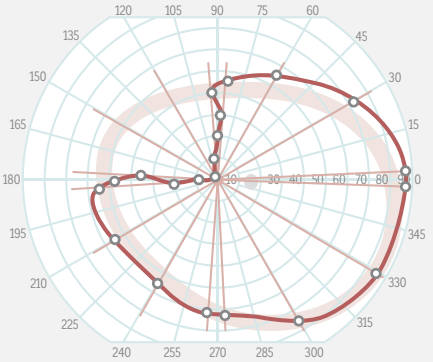


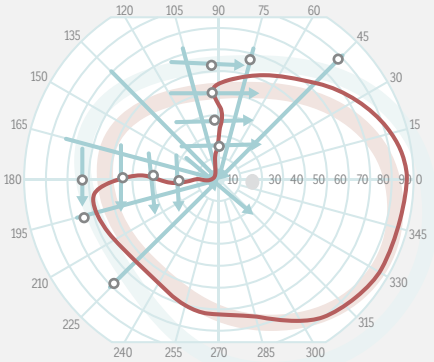
FIGURE 11-21 This example above shows a full kinetic perimetric test of a quadrantanopia with 4 isopters (shown here in blue, red, gray and green), static points and reaction time compensation. Checks for consistent results and false positives are not shown in this example.

STEP-BY-STEP EXAMPLE OF A KINETIC TEST WITH SEVERAL ISOPTERS (STEPS 3-8)

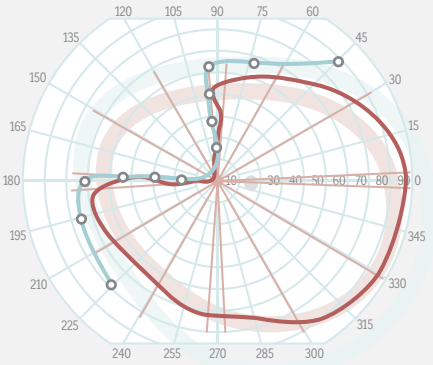
3. Drawing isopter
I4e, 5°/s



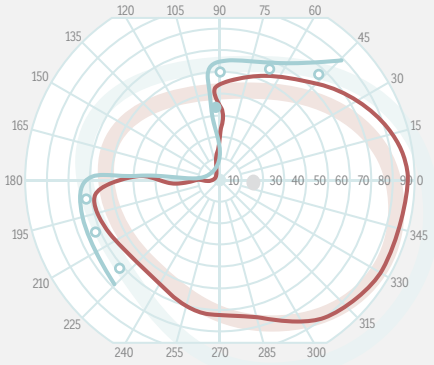
4. Mapping the next outline of hill of vision & detailing boundaries of isopter in abnormal response region
V4e, 5°/s



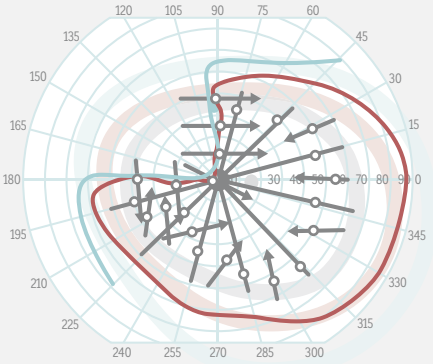
5. Drawing isopter
V4e, 5°/s



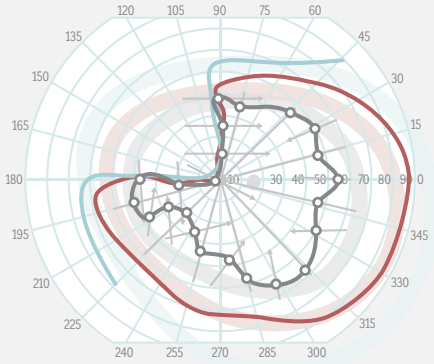
6. Spot-checking between isopters
Use stimulus type from outer isopter
V4e, 0°/s



7. Mapping the next outline of hill of vision & detailing boundaries of isopter
I2e, 5°/s

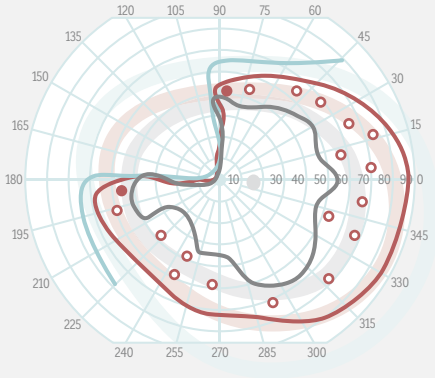


8. Drawing isopter
I2e, 5°/s

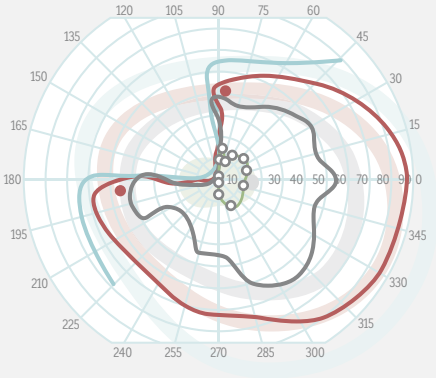


STEP-BY-STEP EXAMPLE OF A KINETIC TEST WITH SEVERAL ISOPTERS (STEPS 9-14)

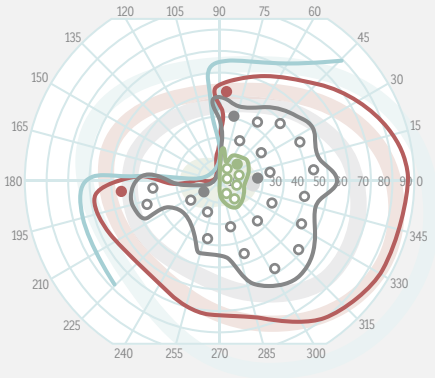
9. Spot-checking between isopters
Use stimulus type from outer isopter
I4e, 0°/s



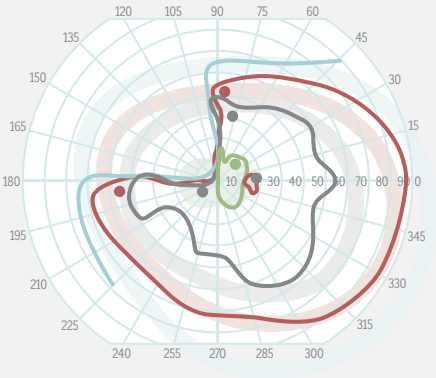
10. Mapping the next outline of hill of vision
& detailing boundaries & drawing isopter
I1e, 2°/s



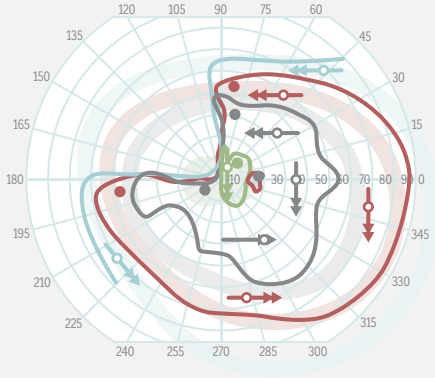
11. Spot-checking between isopters
Use stimulus type from outer isopter
I2e, 0°/s, I1e, 0°/s



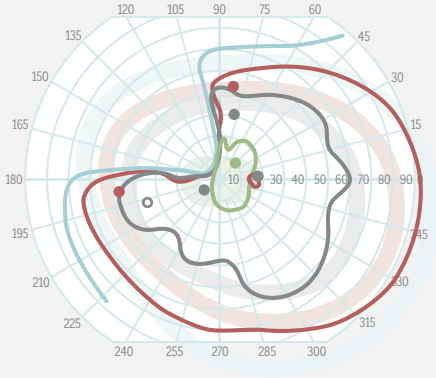
12. Mapping of isolated defect
(blind spot)
I4e, 2°/s



13. Draw reaction time vectors
in visible area
RT vectors, same intensity, size
and speed as respective standard vector



14. Reaction-time compensation
RT on



AUTOMATION OF KINETIC PERIMETRY

MANUAL KINETIC PERIMETRY – FULL FLEXIBILITY

In manual kinetic perimetry, the operator draws each vector individually for each patient. This procedure, which is used on manual Goldmann perimeters, is fully implemented on the Octopus perimeters. Therefore, a Goldmann manual perimetric test can be performed on the Octopus perimeter. The example presented above illustrates the flexibility of manual kinetic perimetry.

Manual kinetic perimetry is still widely used today because it allows full flexibility to adapt to any patient situation. A drawback of manual kinetic perimetry is the lack of consensus for a standard way to conduct it. As a result, there is limited comparability between the results obtained from different examiners and clinics. Another drawback is that manual kinetic perimetry requires intensive training and there is a certain operator bias. Simpler procedures are therefore desirable for more consistent and effective clinical workflows.

AUTOMATED KINETIC PERIMETRY– STANDARDIZATION

While kinetic perimetry testing often needs to be individualized, there are certain indications where the expected responses are already known. An example is visual field testing for ptosis, as illustrated in FIG 11-22.

EXAMPLE OF FULLY AUTOMATED KINETIC PERIMETRY TO TEST FOR PTOSIS

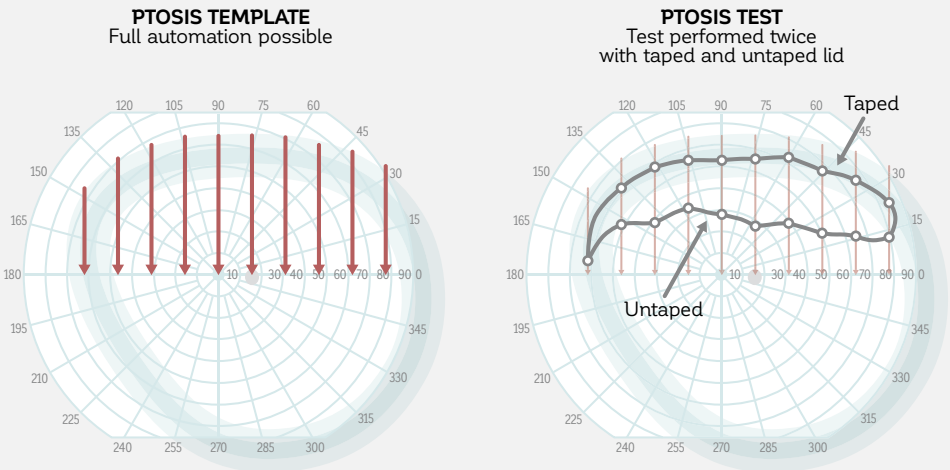


FIGURE 11-22 In ptosis testing, one is trying to identify the exact position of the lid, which always curves upwards from the nasal to temporal side. Therefore, a standardized testing procedure of a few vertical vectors is all that is needed and a very visible and adequately fast III4e to V4e at 3–5°/s is a good stimulus choice. This procedure can be fully automated and performed both on taped and untaped lids.

For any such indication with a clearly known defect pattern, Octopus kinetic perimetry allows storage of fully automated templates that can, once programmed, be run in the same way as Standard Automated Perimetry by simply pressing the start button. Only the isopters remain to be drawn manually.

Full automation not only standardizes kinetic testing and makes it much more comparable across examiners and clinics, it also makes the procedure as easy to learn and perform as static perimetry. As there is currently no consensus on how a certain indication should be tested, each clinic can define the automated templates according to its current testing methodologies.

SEMIAUTOMATED KINETIC PERIMETRY – STANDARDIZATION AND FULL FLEXIBILITY

Semiautomated kinetic perimetry offers the benefits of both automated and manual kinetic perimetry with much less of their respective shortcomings, and is a part of Octopus kinetic perimetry.

In semiautomated kinetic perimetry, the examination is started using a given predefined template in an automated mode. In contrast to automated kinetic perimetry, vectors can be individually added, but responses can also be repeated or deleted if the examiner deems it necessary. Because of the full flexibility offered by semiautomated kinetic perimetry, it can provide results that are as precise as manual kinetic perimetry while greatly improving the standardization within a clinic, as all examiners use

EXAMPLE OF CUSTOMIZED TEMPLATES FOR NEURO-OPHTHALMIC CONDITIONS

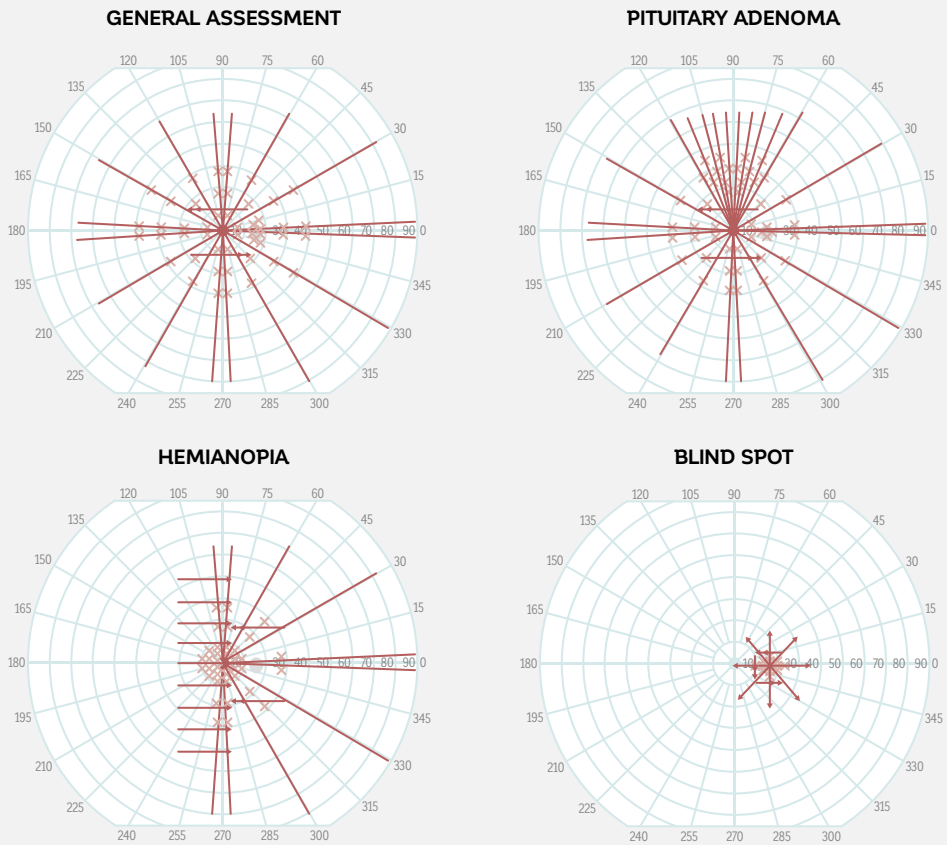


FIGURE 11-23 Kinetic templates allow testing standardization, as the same methodology is always used. Full flexibility of adaptation to a patient's specific situation is also enabled. Above are four examples of templates regularly used in a neuro-ophthalmic clinic.[25-27] For simplicity, only one stimulus type is displayed, but templates with more than one stimulus type are also possible.

the same underlying technique and only make adaptations if the patient requires it. This greatly improves consistency among examiners and facilitates clinical result interpretation.

Many different templates can be created for the most commonly occurring indications, based on each clinic's needs. FIG 11-23 shows a number of templates that can be used in a neuro-ophthalmic clinic. These templates are not considered the only possible templates for such conditions, but rather examples of performing effective kinetic perimetry in these situations.

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