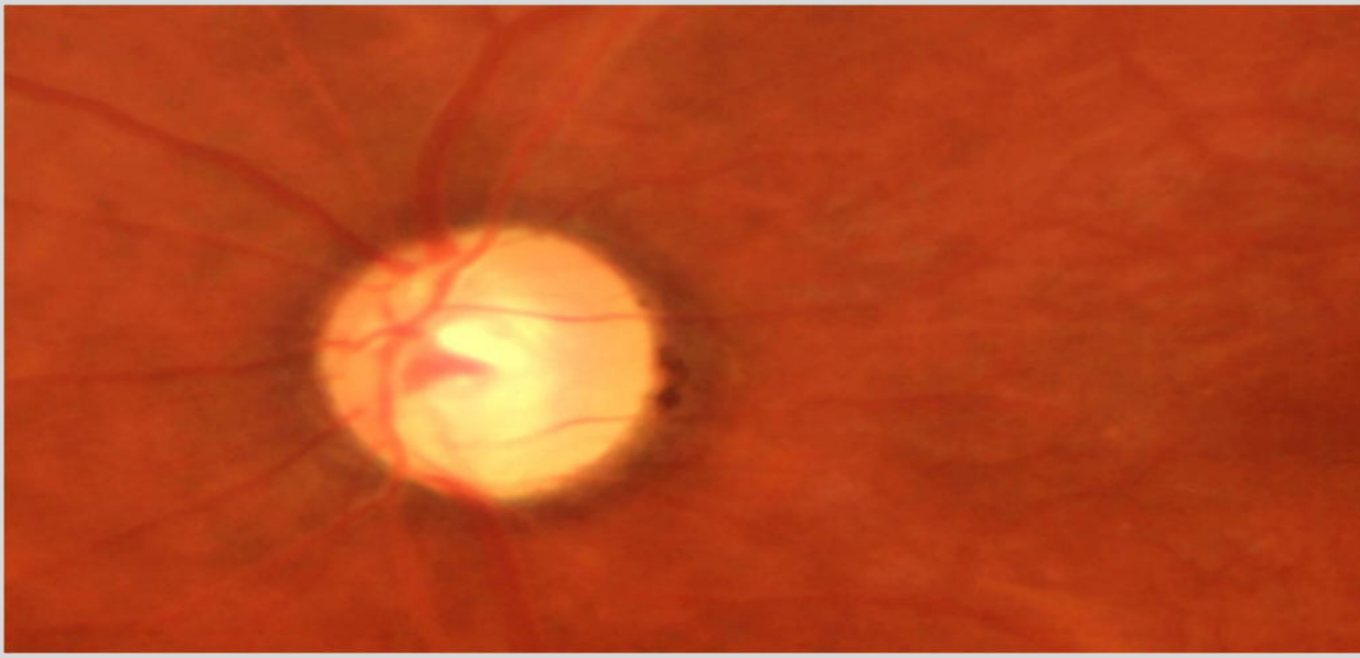
Glaucoma Society of India

GSI Newsletter

Issue No 2; September 2020



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Disclaimer

The aim of GSI newsletter is to provide a platform for ophthalmologists to interact and learn glaucoma from experienced stalwarts, to promote exchange of ideas, news, views and updates. Its content does not represent the official opinion of GSI and all views expressed are those of individual authors.

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Editorial

Dear Seniors, friends and colleagues

Greetings from the Editorial team of the GSI newsletter. The raging Covid-19 pandemic has resulted in cancellation of all physical conferences and has established a new normal of high-quality webinars with participants from across the globe. The Glaucoma Society of India has conducted several excellent webinars in the past few months. The content of some these talks by senior opinion leaders forms the content of this Second Newsletter besides the other regular features. Glaucoma practice had to adapt to the Covid-19 situation and GSI has partnered with AIOS in establishing guidelines for ophthalmic practitioners which has been published in a recent issue of the Indian Journal of Ophthalmology.

The opportunities for glaucoma training in India has been updated in this issue. We were happy to receive very encouraging feedback about the First Newsletter and for this we're grateful to all our readers. Happy reading and as always, we welcome suggestions for improvement of the GSI e-newsletter.

Dr Murali Ariga

Editor-in-chief

Obituary

Dr B Sridhar Rao passed away on August 9, 2020 and we lost one of the most distinguished glaucoma specialist of India. He was popularly known as Dr BSR, was soft spoken and a kind person who was liked by one and all. He was well known for his exceptional teaching skills and clinical acumen. He took care of his patients with utmost care till the end.

His contributions to glaucoma care and teaching in India will always be remembered. His untimely demise is a huge loss for the glaucoma community and we will miss him.

May Lord bless this holy soul.

Dr L Vijaya
Past President
Glaucoma Society of India

On behalf of GSI Family

Glaucoma Suspect

Dr Keerthi B, Dr G Chandra Sekhar

The diagnosis of glaucoma is made in the presence of typical optic nerve head and visual field changes that indicate focal loss of neuroretinal rim or wedge-shaped retinal nerve fiber layer defects with associated visual field changes. Elevated intraocular pressure (IOP) and the associated gonioscopic changes help in identifying the cause as well as to classify glaucoma. Clinically in the presence of changes in any of the four parameters (IOP, gonioscopy, optic nerve, and visual field) that are inconclusive or suspicious of glaucoma, a diagnosis of glaucoma suspect is made. Our ability to differentiate a real increase in IOP from a false high recording or a true glaucomatous disc change from a physiologic mimic (large disc with large physiological cup) would enable us to make the diagnosis of glaucoma suspect less often while identifying the affected eye as either a normal variant or definite early glaucoma.

Thus, glaucoma suspects are important clinical dilemmas. Making a diagnosis of glaucoma suspect is easy and safe for the physician as we are dealing with a potentially blinding disease and, we do not want to take the risk of having missed the diagnosis; however from the patient's point of view the diagnosis of "glaucoma suspect" would mean lifelong fear of impending blindness (especially if someone in the family is blind from glaucoma), the psychological trauma of diagnosis and physical trauma of possible therapy. Clinical experience in glaucoma evaluation would thus mean that over the years, the frequency with which one makes the diagnosis of glaucoma suspect should reduce. Let us briefly explore and understand how we could differentiate true from false-positive findings of these four parameters.

Intraocular pressure

Goldmann applanation tonometry (GAT) is the gold standard for measuring intraocular pressure. There are many sources of error while measuring intraocular pressure with GAT, like calibration errors, improper use of fluorescein dye, pressure on the eye while retracting the lids, and altered central corneal thickness (CCT). The relationship between central corneal thickness and IOP with GAT was described by Ehlers et al [1] in an elegant manometric study, where a general formula was given that for every 70-micron increase in corneal thickness 5 mm Hg can be added and for every 70-micron decrease 5 mm Hg subtracted from the measured IOP while keeping 520 µm as the baseline corneal thickness. It is important to remember that this correction factor is an approximation and one cannot correct the IOP for changes in corneal thickness precisely. There have been multiple formulae given to elicit the relationship between IOP and CCT but none of them agree with each other.[2] Therefore, it is very important to understand that our ability to correct measured IOP for changes in CCT is an approximation only, but not a precise correction.

Several new devices like Dynamic contour tonometer (DCT), Rebound tonometry, Ocular response analyzer (ORA), and

Corvis ST have been introduced to overcome the limitations of GAT.

DCT is approved by the FDA and is based on a new technology that is claimed to be accurate, easy to use, and functions independently of corneal thickness and edema. A population-based cross-sectional study was performed by Francis et al[3] on 2157 participants where mean GAT and DCT IOP levels were compared; DCT consistently overestimated the intraocular pressure compared to GAT.

The other instruments like Rebound, ORA, and Corvis ST are all based on the indentation principle. Though we get many more parameters from these sophisticated instruments they are all obtained by the indentation of the cornea.

In a study by Sushma et al[4], one hundred and twenty-five eyes of 125 patients with normal IOP and corneal thickness were included. The IOP was measured with GAT, DCT, ORA, and Corvis ST, in four different sequences. The limits of agreement on Bland-Altman plots for intraocular pressure measured by ORA and Corvis ST or DCT and Corvis ST were ± 5 mm Hg; while Corvis ST underestimated the IOP when compared to GAT (95% LOA +2.2 to -6.2 mm Hg). Hence, these modern technologies have not offered any better solution than GAT for IOP measurement. It cannot be overemphasized that the noncontact tonometry is only a screening tool and should not be used to diagnose or monitor IOP in glaucomatous eyes.

If we understand and pay attention to the above regarding IOP measurement, it will be clear that a significant number of "glaucoma suspects" are because of the wrong estimation of intraocular pressure. Hence, it is very important to validate the IOP measurements when in doubt.

Gonioscopy

Gonioscopy is the most important technique that helps us to differentiate between the primary angle closure suspect and primary angle closure. The two important questions to be answered while doing gonioscopy are, first if the "angle is occludable" and secondly the details of the normal and abnormal findings in the angle or, "what else is there in the angle". The testing conditions required to answer these two questions are exactly the opposite.

Occludability of angle is assessed in a dark room as the gap between the peripheral cornea and the iris surface (with minimum slit lamp illumination that does not fall on the pupil, allowing the pupil to dilate to its maximum extent), and avoiding indentation/ manipulation. In contrast, for answering question two about the angle structures and associated changes, the pupil is allowed to constrict with bright room light and bright slit lamp illumination, thus opening the angle and further indentation/ manipulation are performed as needed to observe blotchy pigments, synechiae, etc in the angle.

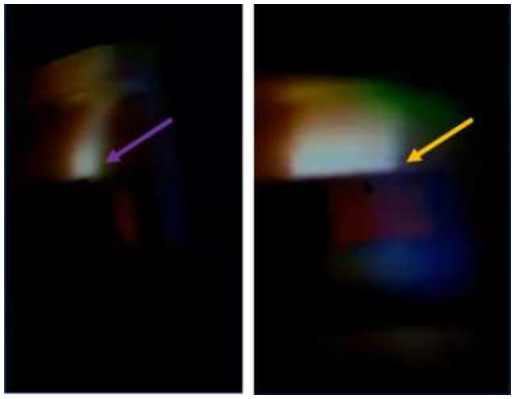

Figure 1: Occludable angles

Figure 1 illustrates an occludable angle where the trabecular meshwork is not visible, however on indentation blotchy pigment (Figure 2) can be seen which is the irregular pigmentation of the trabecular meshwork and this is a definite sign that previous angle closure has occurred.

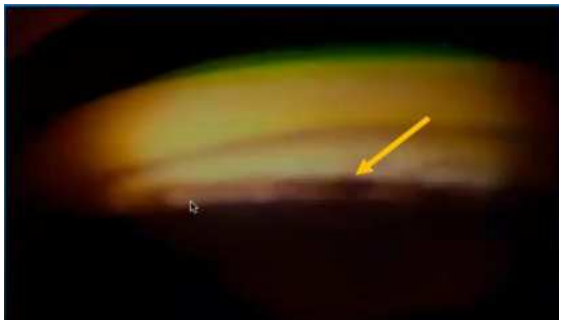

Figure 2: Irregular pigmentation of the trabecular meshwork on indentation

Pigmentation on the back of the cornea (Figure 3 A) can be mistaken for trabecular meshwork and can be misinterpreted as open-angle. The indentation will reveal that there was appositional closure and shows that the actual angle structures are (Figure 3 B) different from the pigmentation on the back of the cornea.

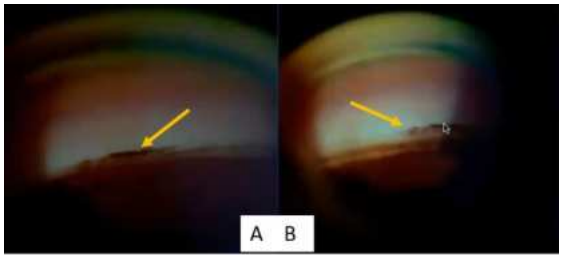

Figure 3: (A) Pigmentation on the back of the cornea, (B) On indentation angle structures are revealed

Another way of identifying the pigment on the back of the cornea is by performing a corneal wedge technique. A thin slit of light from the slit lamp will show the anterior and posterior beams of the cornea, that merge at the Schwalbe's line. Pigment before the merging (pigment on the back of the cornea) is indicative of a pseudo angle. Pigment seen after the beams merge at Schwalbe's line would indicate the true angle and the trabecular meshwork with the pigment.

Peripheral projections of iris (Figure 4A) can be mistaken for synechiae in the angle which disappears on indentation (Figure 4B).

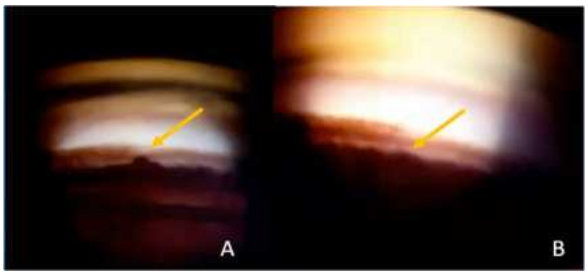

Figure 4: (A) Peipheral projections of iris mistaken as PAS (B) Typically disppear on indentation

Figure 5a illustrates an occludable angle which opens up on indentation with a peripheral bulge in the iris (Figure 5b). Ultrasound biomicroscopy (UBM) revealed a ciliary body cyst (Figure 5c).

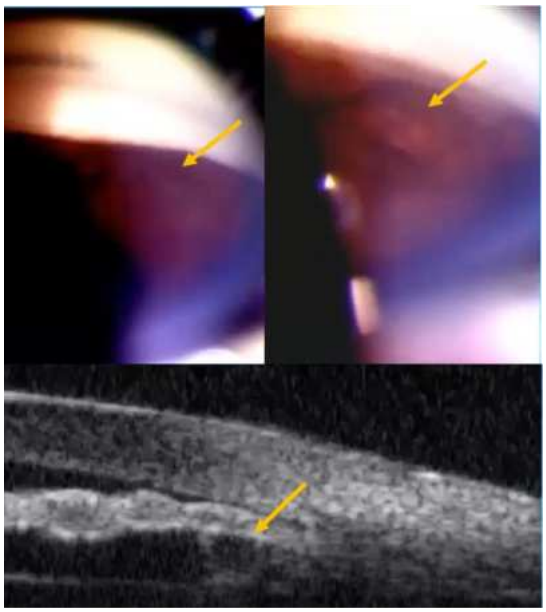

Figure 5: (A & B)Iris cyst as bump on gonioscopy (C) On UBM

It can be seen that by good indentation gonioscopy, a great deal of information

about structures in front of and behind the iris, can be obtained. Only a good gonioscopy can differentiate angle closure disease from ocular hypertension (high IOP with normal disc and no field damage), glaucoma suspect (intermittent angle closure with normal IOP and suspected disc damage), and normal-tension glaucoma (intermittent angle closure with established disc damage). It is very important to understand that gonioscopy cannot be replaced by modern imaging technology like anterior segment optical coherence tomography. Because of high resolution, only a small part of the angle can be imaged that could help in diagnosing primary angle-closure suspect (PACS), but as blotchy pigments/synechiae in the angle cannot be seen by these imaging technologies, PAC and PACS cannot be differentiated by these imaging devices.

Optic nerve

Evaluation of the cup to disc ratio (CDR) without correlating with the disc size is probably the most common basis of a diagnosis of glaucoma suspect. It is important to consider the size of the disc before assessing the CDR. In a small disc, a CDR of 0.3 could be pathological while in a large disc a CDR of 0.8 could be physiological. It is essential to remember that approximately 1.2 million axons pass through the optic nerve head. The space left behind is the cup. Thus, in a large disc, the cup is large to start with. The area of normal disc can range from 0.8 mm ^{2} to a maximum of 6 mm ^{2}. There is no other biological parameter that varies so much in the normal population. Figure 6 shows a very large disc with significant cupping, but the visual field is normal. This is an example of a large disc with a large physiological cup.

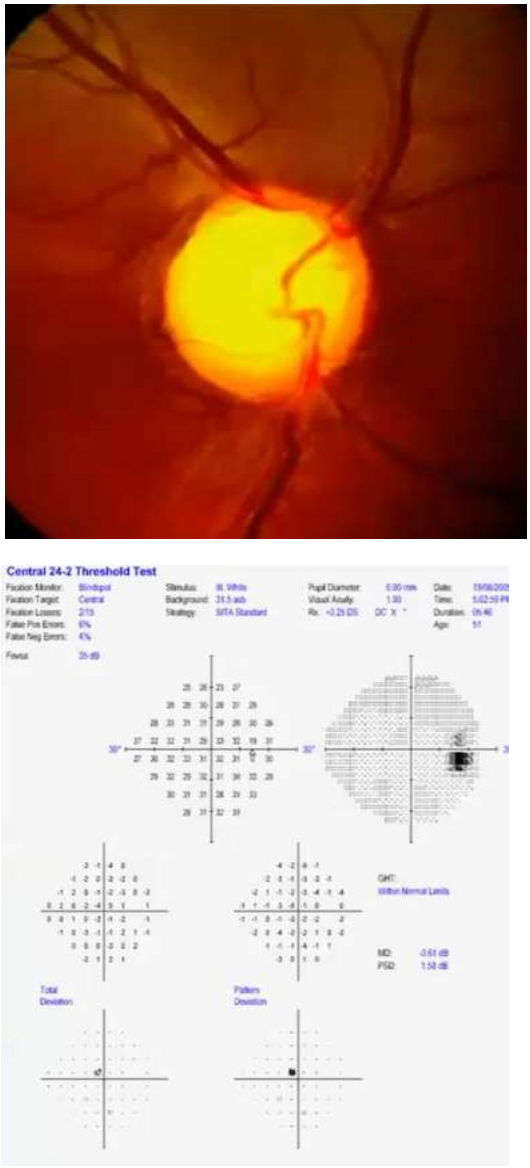

Figure 6: Large disc with large physiological cup with normal visual fields

Typically in a round disc that inserts into the sclera without tilt, the ISNT rule (inferior is the thickest neuroretinal rim followed by superior, nasal and finally temporal rim is the thinnest) is followed. This happens about 83% of the time. In a tilted disc as seen in figure 7, the ISNT rule is not followed. The inferior tilting of the disc results in a thin and sloping inferior rim but the visual field is normal.

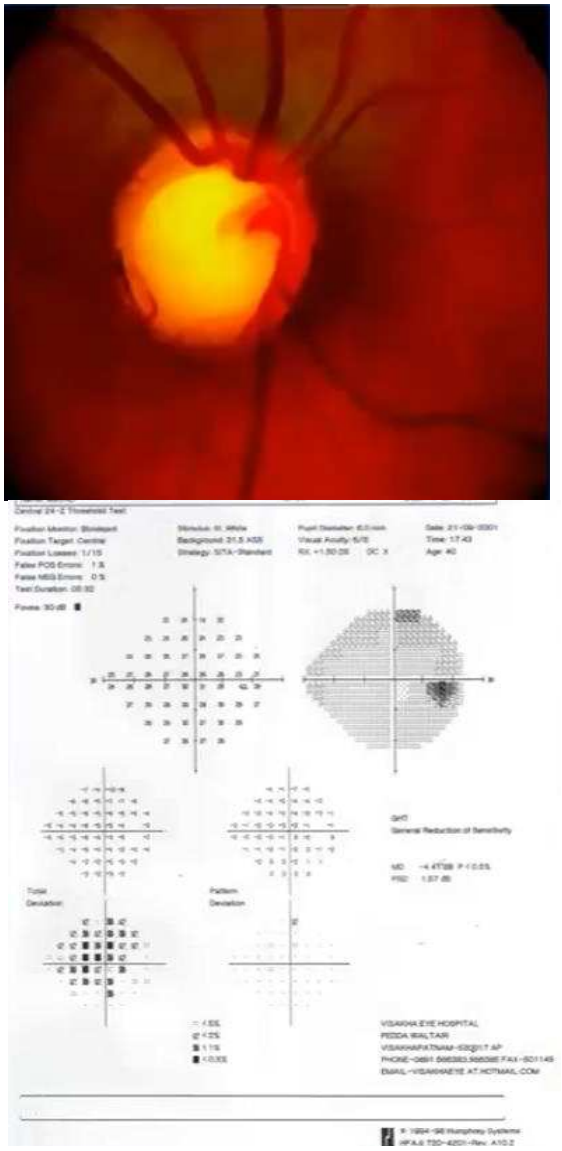

Figure 7: Inferiorly tilted disc that does not follow the ISNT rule. The sharpness of neuroretinal rim and cup border superiorly and the superior course of the blood vessels on the disc give us a clue about the tilt of the disc

In a myopic tilted disc, evaluation of the neuroretinal rim would be difficult and red-free photographs can be used to assess the RNFL. Figure 8 shows a superiorly tilted disc with normal RNFL on the red-free photograph and a normal visual field (inferior rim artifact).

Figure 9 shows bilateral myopic tilted discs, the right eye is normal with intact RNFL, while the left eye shows an inferior RNFL defect with superior field loss.

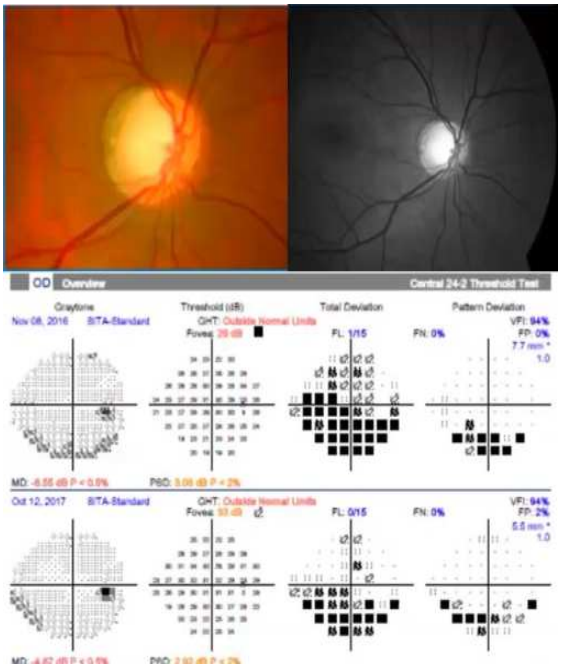

Figure 8: Normal myopic tilted disc with normal visual fields and inferior rim artefact

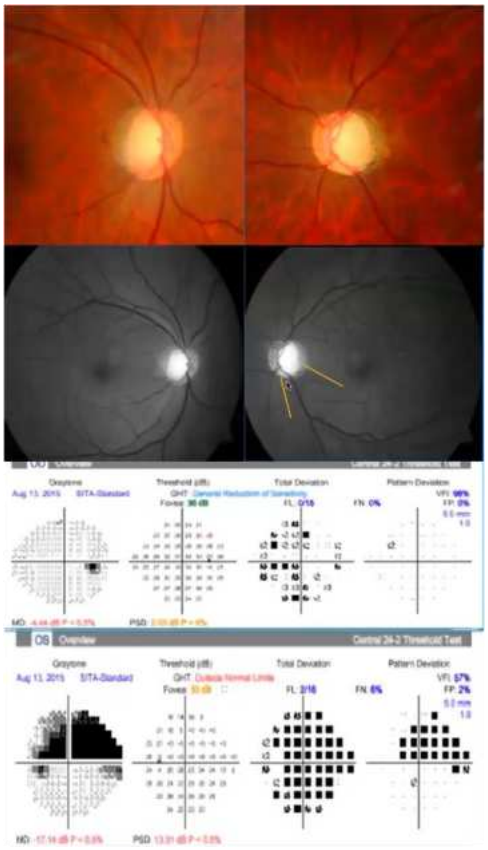

Figure 9: A case of myopic tilted discs in both eyes. Red free photograph of right eye shows normal RNFL, while left eye shows inferior wedge defect correlating with superior field loss.

Now let us look at a small glaucomatous disc. Figure 10 shows a disc that is pink and looks normal on a cursory examination. If we look at the rim carefully, the inferior rim is very narrow compared to the superior and there is also an inferior nerve fiber layer defect, which translates to a superior field defect.

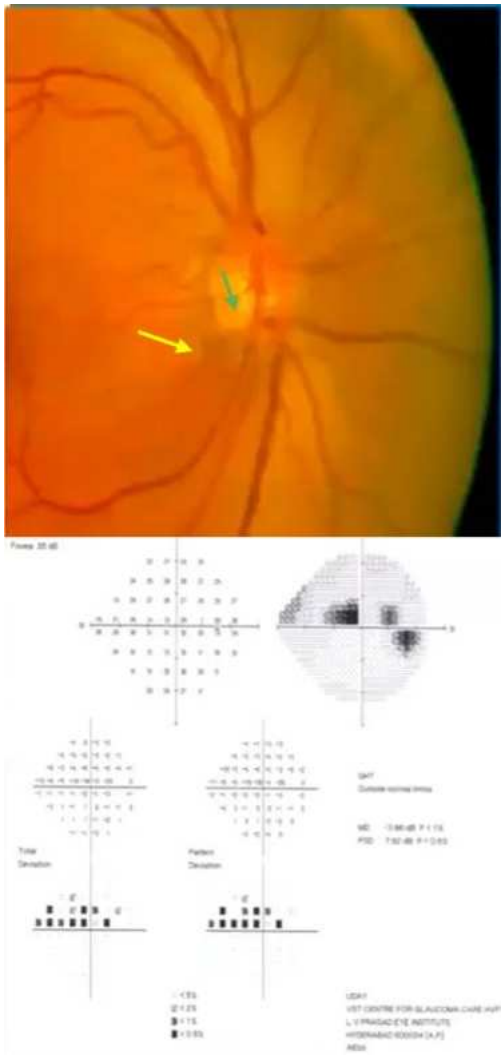

Figure 10: Small sized disc with inferior nerve fiber layer defect (yellow arrow) and inferior excavation (green arrow) and corresponding superior scotoma involving fixation on visual field

In comparison to figure 10, figure 11 shows more severe cupping, but the disc is large and the damage in the visual field is less severe. So, a large disc not only results in an overdiagnosis of the disease but also an overestimation of the severity of the damage.

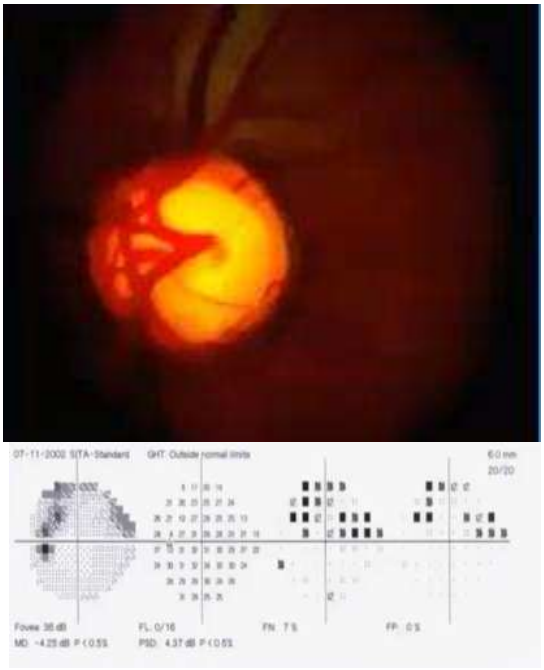

Figure 11: Large sized disc with inferior excavation and corresponding superior arcuate scotoma

Examining nerve fiber layer defect is another important component of optic nerve evaluation. Since in early glaucoma only one hemisphere is affected, clinical suspicion of which hemisphere is abnormal is very crucial.

In figure 12, there is a superior RNFL defect seen in the fundus photo (yellow arrow). The visual field is unreliable but a subtle inferior scotoma correlates well with the RNFL defect. Thus, a diagnosis of glaucoma can be made. If there is uncertainty about the RNFL defect clinically, imaging could help, as seen in the left eye OCT print out of this case, only the superior RNFL and GCIPL complex are abnormal. This validates the field defect as well as the RNFL defect seen in the clinical photograph. Thus, imaging can help confirm the subtle

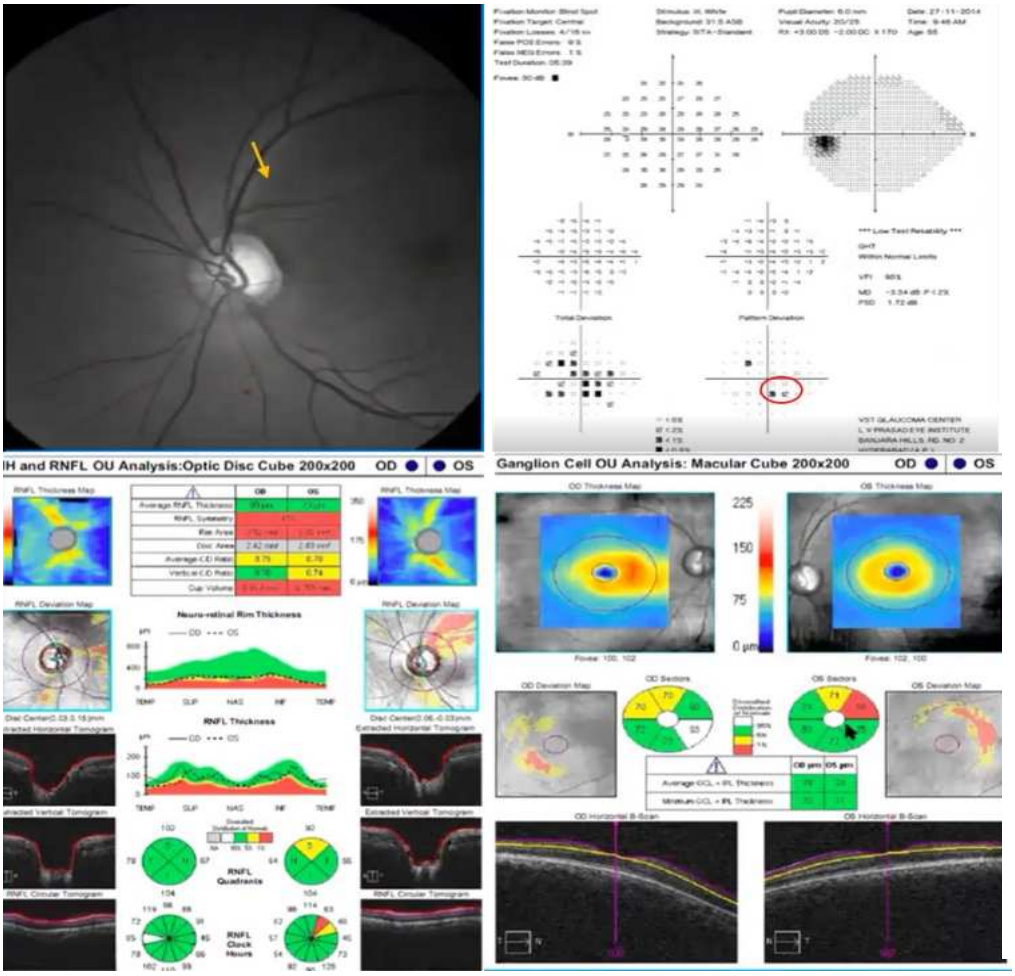

Figure 12: Imaging technology can help us to confirm the subtle clinical findings

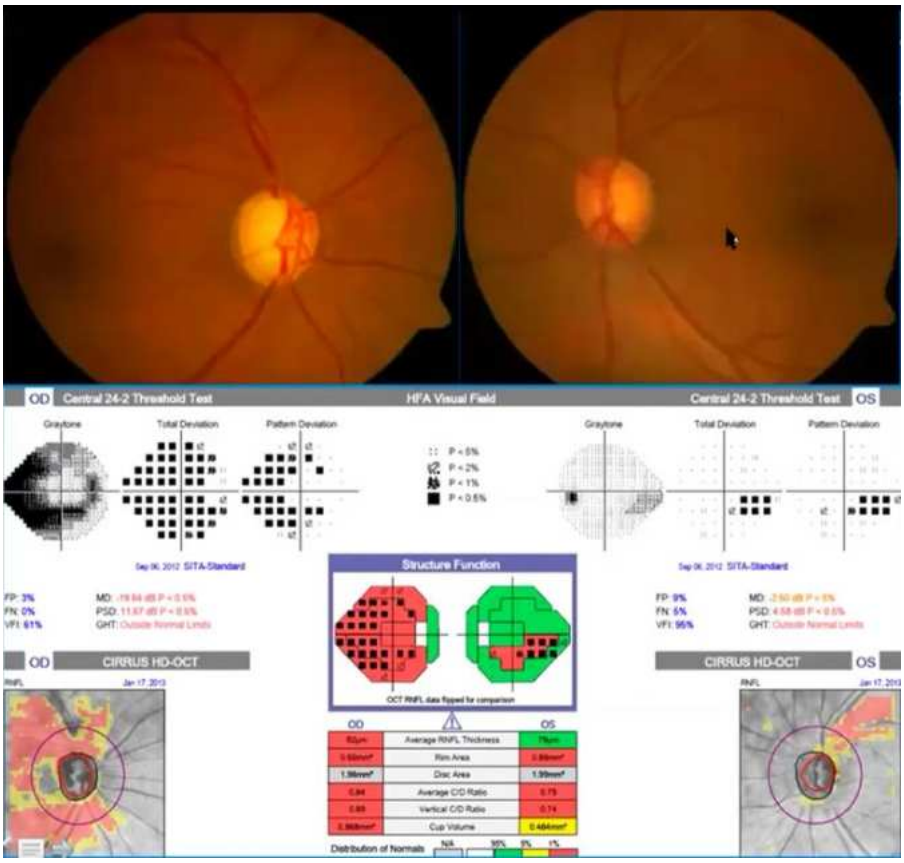

Figure 13: Structure-function correlation print out

clinical findings. One can generate structure-function correlation print outs. In figure 13, the red of the OCT and the probability plots of the visual field correlate, hence the imaging defect is true positive. However, in figure 14, especially the right eye, there is a lot of red in OCT, but the visual field does not show any loss and the optic disc looks healthy. This is false positive on OCT and should not be interpreted as pre-perimetric damage. Hence, a conclusive diagnosis of glaucoma in a previously suspected patient can be achieved through corroboration of tests (structure-function, function- function, structure- structure) or upon reproducible findings using a single diagnostic test.

Decreased central vision, loss of colour vision are not signs of glaucomatous disc damage. In the presence of these, neuro-ophthalmological causes of loss of vision should to be ruled out.

Visual field defect

A detailed discussion of perimetry is beyond the scope of this article. The point to reiterate is the examples of disc and field correlation that are presented in figures 9 through 14.

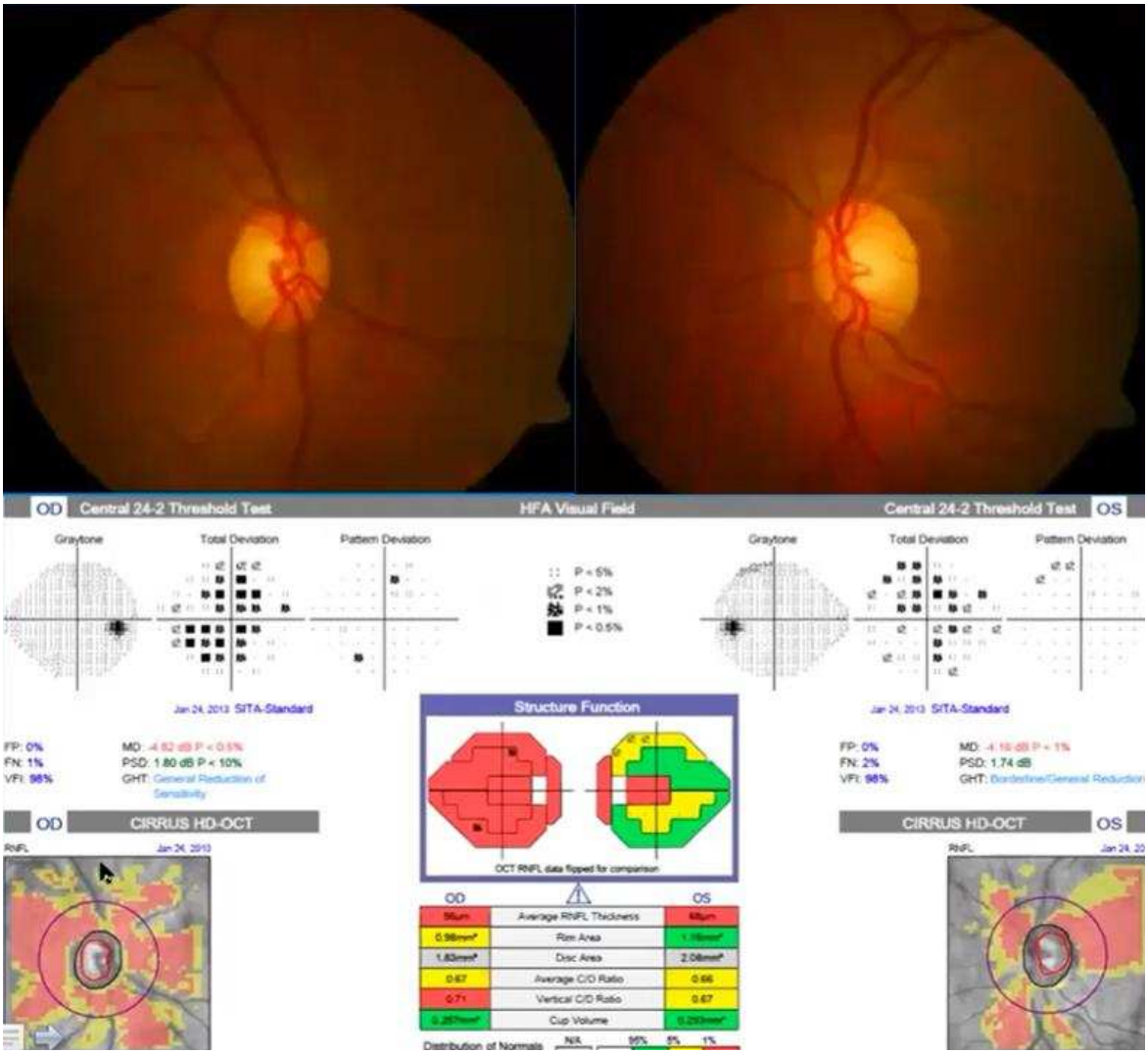

Figure 14: False positive results on OCT

It is important to remember the non-glaucomatous field defects. While chiasmal compression is a serious condition that can mimic glaucoma (Figure 15), there are other examples.

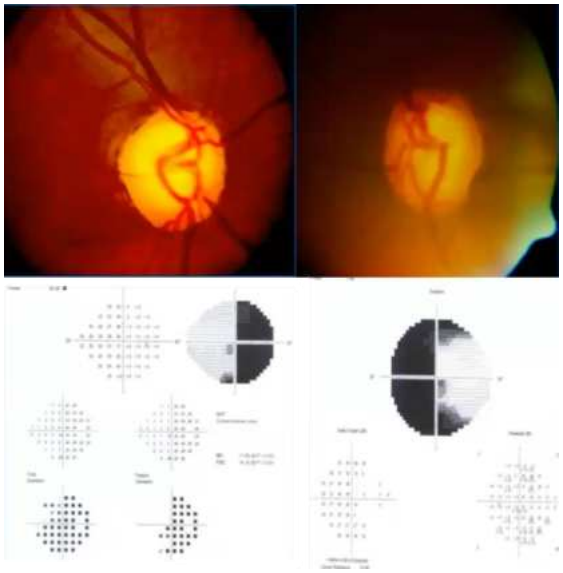

Figure 15: Glaucomatous looking discs in both eyes, but the bitemporal hemianopia is suggestive of chiasmal compression.

Figure 16 shows an inferior non-progressive field defect (visual fields shows no change in scotoma over time) located outside the arcuate area. The RNFL defect at 12 O' clock position (marked with a yellow arrow in color and red-free fundus photo) is diagnostic of superior segmental optic nerve hypoplasia (SSONH), a congenital anomaly.

Figure 17 shows a central defect respecting both vertical and horizontal meridians. This is quite often produced by branch retinal vein occlusion.

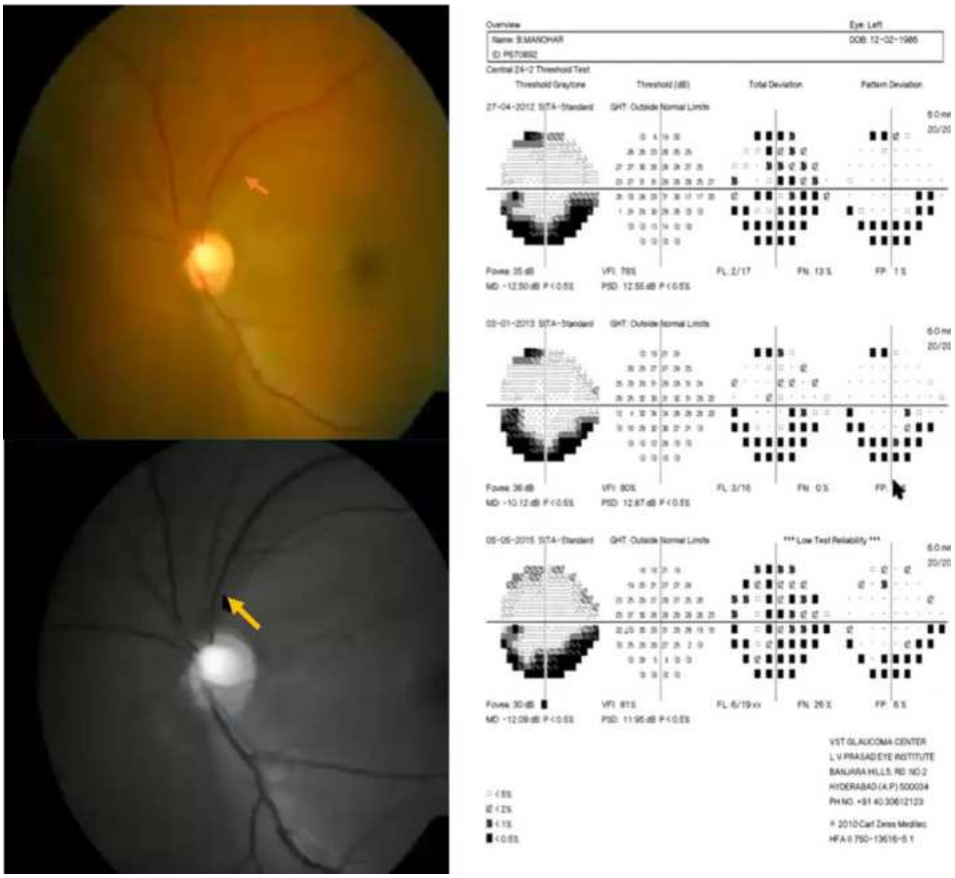

Figure 16: A classical inferior field defect that does not progress and not present in the arcuate area is produced by superior segmental hypoplasia

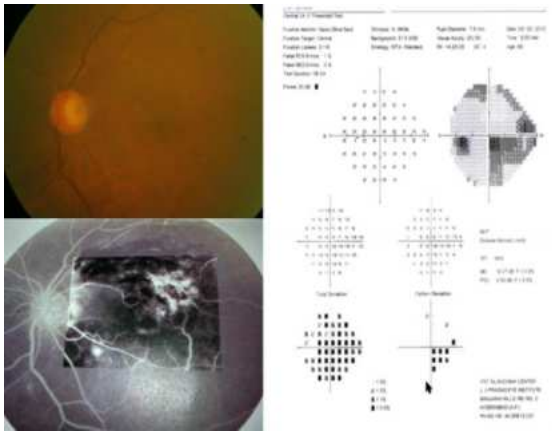

Figure 17 shows a central defect respecting both vertical and horizontal meridians. This is quite often produced by branch retinal vein occlusion.

Philosophy

Even if we exclude all false-positive signs of damage, we will still come across cases that are glaucoma suspects. Let us address how to approach these patients. We as physicians and the patients as well as their families are concerned because glaucoma can result in irreversible blindness. We are also taught that early diagnosis is very important to prevent glaucoma blindness.

However, we do not consider the fact that blindness is a concern in patients already having significant damage. In a patient labeled as " glaucoma suspect", there is no damage and we are debating the diagnosis. It is also known that a significant number of glaucoma patients have an improvement in the visual field (beyond the learning curve) and only a minority of patients progress despite regular treatment. In a large series of patients in our institute, the proportion of those progressing at rates worse than -1 dB per year was less than 15%.[5]

Saunders et al[6], retrospectively reviewed the visual field series of at least 3 years' duration from 3790 glaucoma patients and calculated rates of loss for each eye using linear regression of mean deviation (MD) over time. Residual life expectancies derived from the UK Office of National Statistics actuarial tables for each patient was combined with these rates to estimate predicted MDs at end of the expected lifetime. Only 3.0% (95% confidence interval [CI] 2.7%–3.4%) of the eyes progressed at a rate faster than 1.5 dB/year (n = 7149 eyes). Of those patients with both eyes followed, 5.2% (CI 4.5%–6.0%) were predicted to progress to statutory blindness (MD: 22 dB or worse), with a further 10.4% (CI 9.4%– 11.4%) reaching visual impairment (MD: 14 dB or worse) in their lifetime. More than 90% (CI 85.7%–94.3%) of patients predicted to progress to statutory blindness, had an MD worse than 6 dB in at least one eye at presentation. This modeling exercise indicates that most patients in glaucoma clinics are not at high risk of progressing to statutory blindness.

The above two studies reinforce the fact that on routine clinical care, the chances of patients developing blindness is relatively low. This should modify how we approach and talk to our glaucoma suspect patients. It is worthwhile to recollect the definition of health given by WHO, as a state of complete physical, mental, and social well-being and not merely absence of disease or infirmity. In that context "*Glaucoma Suspect*" diagnosis affects a patient's health status adversely and thus, it becomes an iatrogenic disease. The diagnosis needs to be made responsibly as once someone is labeled a suspect, he will be a suspect for life.

In conclusion, we need to enhance our ability to pick up the subtle findings that would help us differentiate suspects as

either normal or early disease. When this decision cannot be made in the first visit, follow up in 1 to 2 years should help us revise the diagnosis. In the interim, we should be supportive and not scare ourselves and the patient about the unlikely event of impending blindness. Management decisions need to be taken along with the patient with a detailed discussion, rather than "playing safe". Diurnal variation of IOP with unilateral trials can be useful in managing some of these patients.

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This article is based on the talk delivered by Dr G Chandra Sekhar, LV Prasad Eye Institute, Hyderabad in webinar dated 24.04.2020

Dr B Sridhar Rao

(September 24' 1953-August 9'2020)

Dr B Sridhar Rao, popularly known as Dr BSR, was born on September 24th 1953 at Chennai, to Dr.B.Krishnamurthy Rao (pulmonary physician, Indian railways) and Mrs. B.K.Savithri, had four siblings. His family includes wife Anuradha, son Dr Shyam and his family.He did his MBBS from JIPMER, Pondicherry, MS (Ophthalmology) from Maulana Azad Medical college, New Delhi, Vitreo-retinal diseases fellowship at Sankara Nethralaya, Chennai. Had his short-term glaucoma training at Mass Eye Infirmary, Boston, USA. Later he did his clinical research fellowship at Alcon Laboratories, Fort Worth, USA, and graduate summer course in epidemiology, Johns Hopkins University, Baltimore, USA. He was associated with Sankara Nethralaya, Chennai from 1981 to 1995, held many positions - senior consultant, head of the glaucoma department and director clinical research. He was president of Glaucoma Society of India (2009-11). He was a popular and sought after faculty for many meetings across the country. He received many honours to name a few - Dr Joseph Gnanadickam gold medal, by Tamil Nadu Ophthalmic Association, 1999,Dr Rustomji Ranji Gold medal, by Andhra Pradesh Ophthalmic Association, 1999,Dr Noel Moniz Memorial Oration Award, by Kochi Ophthalmic Club 2011, Dr Prof V Velayudham Memorial Glaucoma Oration Award, by Tambaram Ophthalmic Society 2017 and Professor N.N. Sood Oration Award, Glaucoma Society of India 2018.

Dr L Vijaya
Senior Consultant,
Sankara Nethralya, Chennai

Basics of Visual Field

Dr GR Reddy

Visual fields are the gold standard in the field of glaucoma which aids in the diagnosis and in setting the target IOP to arrest progression and onset of new field defects. Understanding of a single field analysis prints out is a mandate for systematic approach to interpret visual field printout. It is divided into 11 zones broadly; these 11 zones can be classified into 2 groups:

Group-1 consists of zones independent on normative data and STATPAC analysis. Zone 1 Patient data / test data

Zone-2 Reliability indices

Zone 3 Raw data

Zone 4 Grey scale

Group-2 consists of zones dependent on normative data and STATPAC analysis.

Zone 5 Total deviation numerical plot

Zone 6 Total deviation probability plot

Zone 7 Pattern deviation numerical plot

Zone 8 Pattern deviation probability plot

Zone 9 Global indices

Zone 10 Glaucoma Hemi Field test

Zone 11Gaze tracking

Zone 1 Patient data and test data should be exactly similar to that given in the order form for visual field testing which is a mandate to obtain an over view print out.

Age of the patient should be entered accurately else age matched data will be inaccurate.

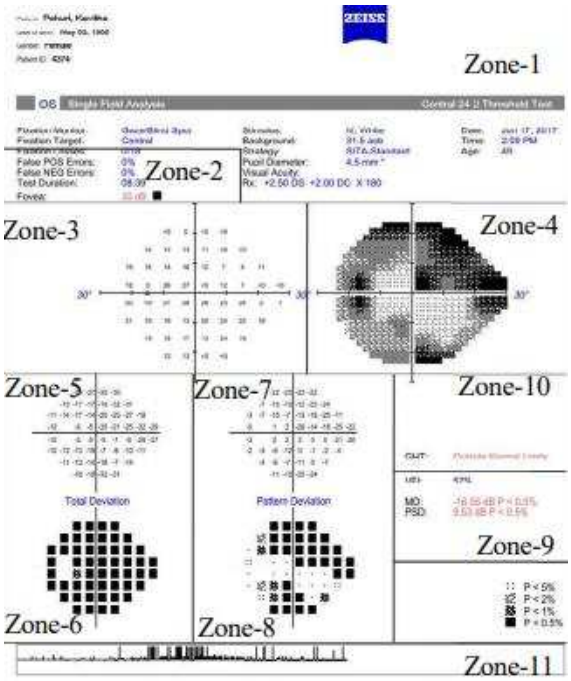


Figure 1: Parts of a single visual field (Humphrey) print out

Zone 2 and Zone 11-Reliability indices and Gaze tracking: Performance by the patient is gauged by the reliability indices and gaze tracking. Least False positives (FP), false negatives (FN) and fixation losses (FL) indicate good reliability. The FP index is the most important and useful of the three available reliability indices. FP exceeding 15% is strongly associated with compromised test results and the test should be repeated. Try achieving reliability indices near to 100% perfection especially in cases of glaucoma suspect. In gaze tracking, upward deflections indicate gaze error.

Downward deflections indicate absent pupil images or corneal reflexes (usually from blinks).

Zone 3 Raw data: It is the measured retinal sensitivity in dB units at that particular point. The numerical value is directly proportional to the retinal sensitivity. A < sign in front of 0 indicates an absolute scotoma. A < sign in front of a numerical value indicates the time to change the bulb or need to calibrate the machine. Low retinal sensitivity in the central 16 points of 24-2 (where a higher sensitivity is anticipated) is an indication to repeat the test with 10-2 and assess if glaucoma is originating in central 100 circle area.

Zone 4 -Grey scale: Grey scale is the pictorial form of the raw data where different shades of grey are given for different range of sensitivity. Grey scale gives valuable information regarding pattern of the field defect, multi centric origin of glaucoma, depth of the scotoma (increase in dark shade) horizontal and vertical progression on follow-up tests. The main disadvantage of grey scale is that a mild to moderate loss of sensitivity in the central 100 area will not be appreciated at the earliest owing to its brighter shade.

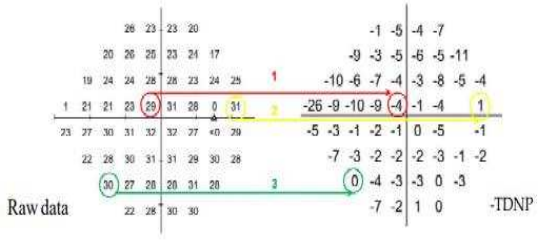


Figure 2: Raw data is expressed as deviation values from the normative data (The deviations from the slope of hill of vision) in total deviation numerical value. The normative data at 1, 2, and 3 are 33dB,30 dB, and 30 dB respectively.(Normative data - raw data = Total deviation numerical plot)

Zone 5-Total deviation numerical plot (TDNP): TDNP is nothing but raw data expressed as deviation values from the normative data (deviation from normal slope of hill of vision), as seen in figure 2.

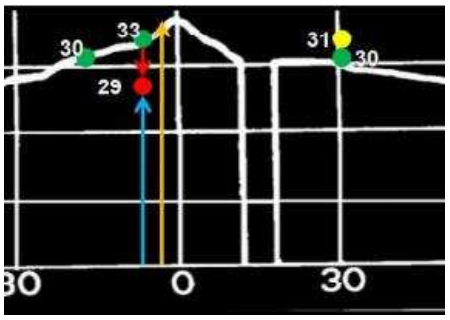


Figure 3: Points on the no normal slope of vision are no loss of sensitivity points. Points above normal slope of vision are better sensitivity points. Points below normal slope of vision are loss of sensitivity points

The exact depth of the scotoma is known from TDNP. The numerical values of TDNP can be divided into three groups (Figure 4).

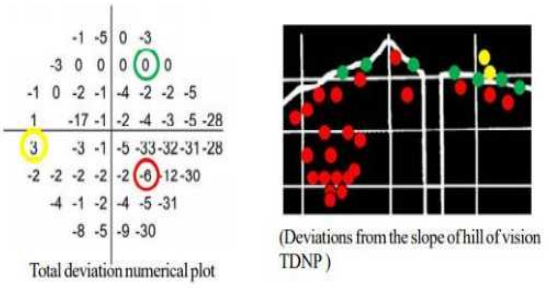


*Figure 4: The numerical values of TDNP can be divided into three groups: **Group 1**-The deviation values without any sign (Yellow colored). These are points with sensitivity better than normal. These points will be above the slope of hill of vision. **Group 2**- 0 deviations (Green colored). These are the points with no loss of sensitivity. These points are positioned on the normal slope of hill of vision. **Group 3**-The deviation values with (-) minus sign (Red colored). These are the points with loss of sensitivity. Higher the deviation value deeper is the scotoma and vice versa. Superficial scotoma with lesser deviation will be close to normal slope of hill of vision.*

Zone 6 Total deviation probability plot (TDPP): Total deviation probability plot gives the extent and pattern of the field defect but not its depth.

STATPAC calculates the P value of the points with loss of sensitivity. Each deviation value of the TDNP is given a symbol according to its P value and is plotted as total deviation probability plot. The superficial scotoma will be represented by P values ranging from 6 dB at most of the points.

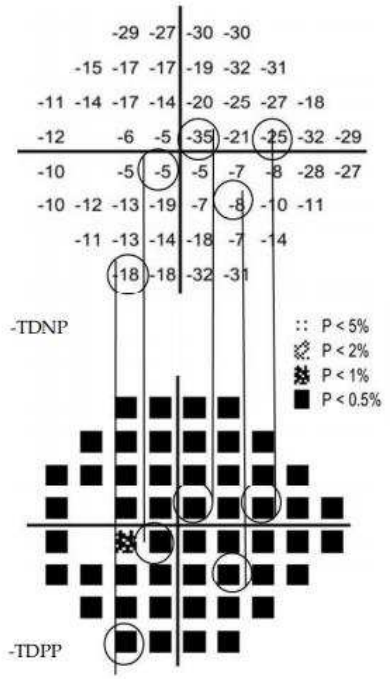
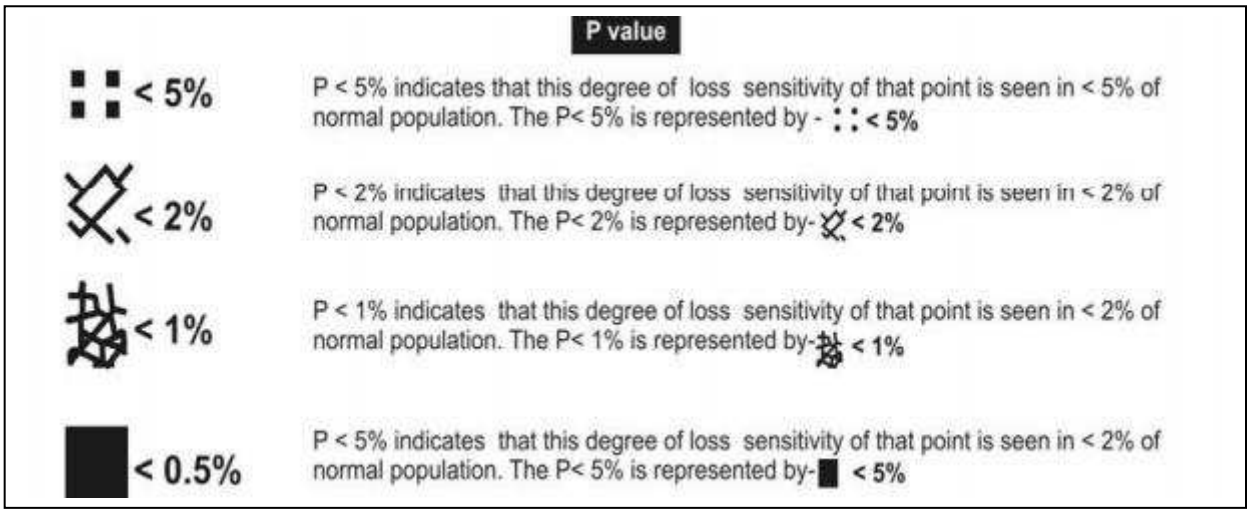


Figure 5: Total deviation probability plot derived from values of total deviation numerical plot

Probability plots of a case of cataract shows uniform generalized depression with black squares at most of the points. If this cataract patient develops a localized field defect either due to glaucoma or any other cause, will not be appreciated in TDPP as majority of points are already black squares. Hence pattern deviation plots are created to identify these localized field defects in generalized depression. This localized field defect can actually be appreciated in the raw data, grey scale, and total deviation numerical plot though masked in generalized depression of TDPP.

The probability symbols are detailed in the box below.



Zone 7 & Zone 8 Pattern deviation plots: The basic concept behind the creation of pattern plots is to remove generalized depression from total deviation plots till a certain percentage of points are not represented by any P value in PDPP. The dB value that converts 7th best deviation point to normal sensitivity point or to (0) deviation point is added to all points in TDNP to convert TDNP to PDNP.

The 7th best point was preferred to any other point as about 15% of the points of TDPP will not be represented by any P value symbol in PDPP. If higher number is selected, the recent onset scotoma will not be represented by any P value symbol and the direction of progression is likely to be missed.

Conversion of total deviation numerical plot to pattern deviation numerical plot can be explained in three steps:

Step 1 -Identification of 7th best deviation point of TDNP(Figure 6)

The most important key point for the conversion of total deviation numerical plot to pattern deviation numerical plot is identification of 7th best deviation point of TDNP. Before identifying 7th best deviation point of TDNP, the following points is to be noted.

(a) In 30-2 point pattern, only points of 24-2 point pattern are considered

(b) In 30-2 & 24-2 point patterns, the three points in the area of blind spot are ignored.

(c) In 10-2 point pattern all 68 points are considered. (Blind spot is present outside central 10°field.

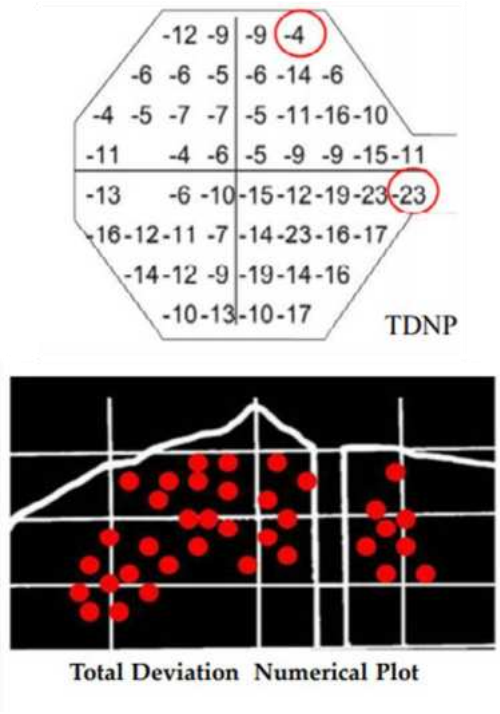


Figure 6: Identifying 7th best deviation point

All the points are in this TDNP are with (-) minus sign in front of the deviation values. These points represent loss of sensitivity. -4 dB deviation points is the best deviation point and -23 dB deviations is the worst deviation point of this TDNP. There are no normal sensitivity points or points whose sensitivity is better than normal in this TDNP.

Now the computer arranges the deviation points of the total deviation numerical plot in a chronological order on the basis of deviation values from the normative data. The first point is the best deviation point and the last point being the worst deviation point. The computer selects the 7th best deviation point after ignoring the mentioned

points while arranging the deviation values in a chronological order. All these calculations will be done by the software in the field analyzer (Figure 7).

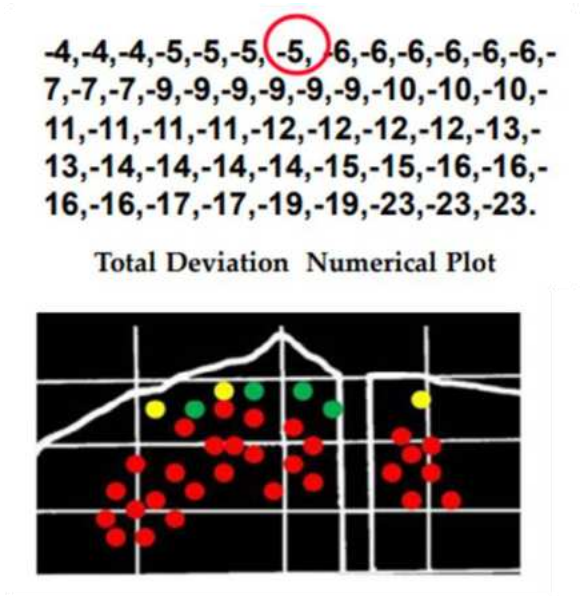


Figure 7: Deviation points arranged in chronological order (-4 dB loss of sensitivity points are represented by yellow dots, and -5dB points are represented by red dots. The 7th best deviation is -5dB)

Step 2: Converting the 7th best deviation point to zero (0) deviation point

Converting the 7th best deviation point to zero (0) deviation point or in other words bringing the 7th best deviation point to normal the contour of hill of vision. Since 7th best deviation point is -5 dB, we have to add (+) 5 dB to make the 7th best deviation point to zero (0) deviation point or in other words to bring the 7th best deviation point to normal the contour of hill of vision (Figure 8).

Step 3 - (+)5 dB value that makes the 7th best deviation point to zero (0) deviation is added to all points of TDNP to convert it to PDNP (Figure 9).

When we select 7th best deviation point is taken into consideration to convert TDNP to PDNP, minimum 15% of the points (shown in red colour in Figure 10) will not be represented by any significant P value symbol in PDPP.

PDPP is always localized scotoma and minimum 15% points without significant P value symbol. These points without significant P value symbol are enough to highlight the pattern & the direction of progression of the field defect present in a generalized depression of TDPP. That is why 7th best deviation point was selected to convert TDNP to PDNP.

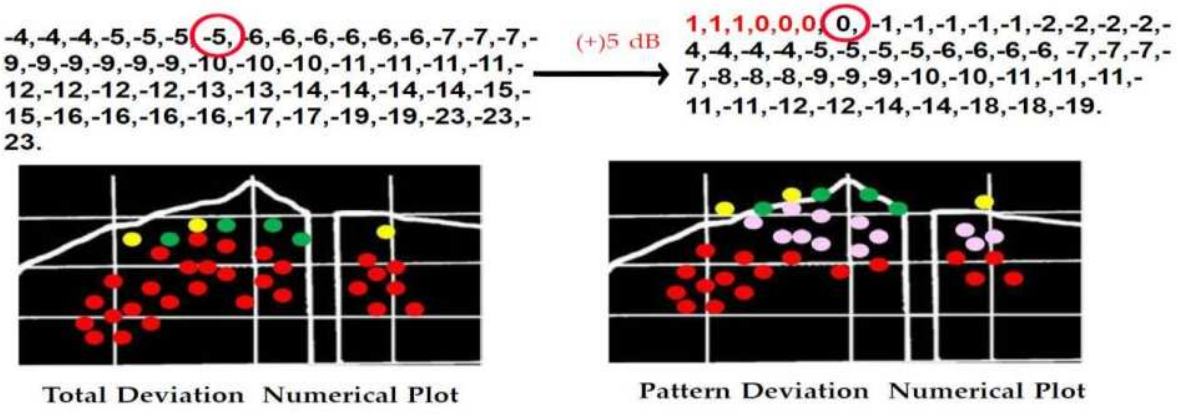


Figure 8: -4 dB deviation value points are shown as yellow points because they are going to become better sensitivity points in PDNP. The 7th best deviation points are shown as green points because they are going to become normal points in PDNP. Superficial scotomas in PDNP are shown as magenta colour points as they will be close to normal slope of vision

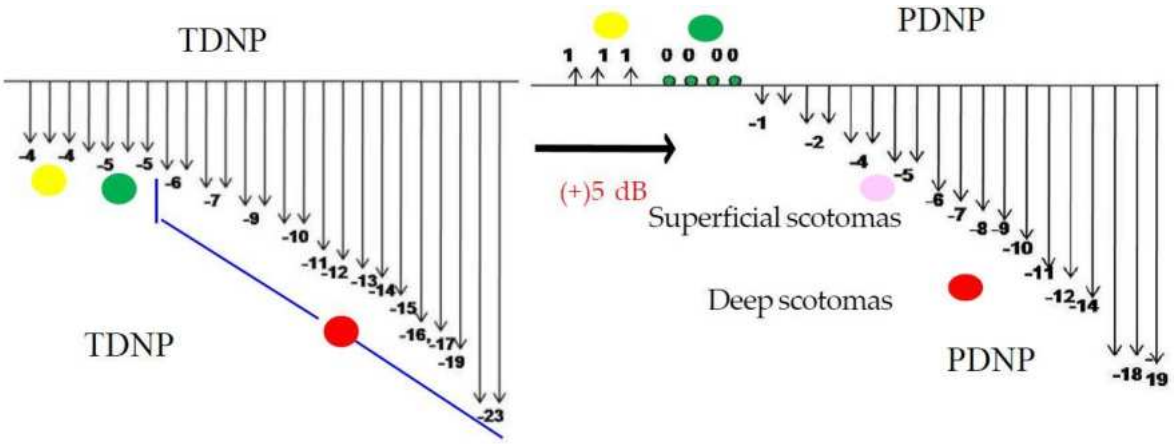


Figure 9: By elevating the sensitivity of each point by 5 dB value, the 7th best deviation point becomes normal (0 deviation point) and the first six best points of TDNP become 1,1,1,0,0,0,deviations respectively in PDNP in this print out. From this it is very clear that the pattern deviation probability plot will never show generalized depression and always will have at least seven points without any significant P value symbol in the PDNP. The pattern and extent of the field defect will be appreciated in any situation in PDPP. By identifying the superficial scotomas (points with P value symbols ***except P< 0 .5%),*** *in PDPP,* ***the direction of progression of the field defect will be known.***

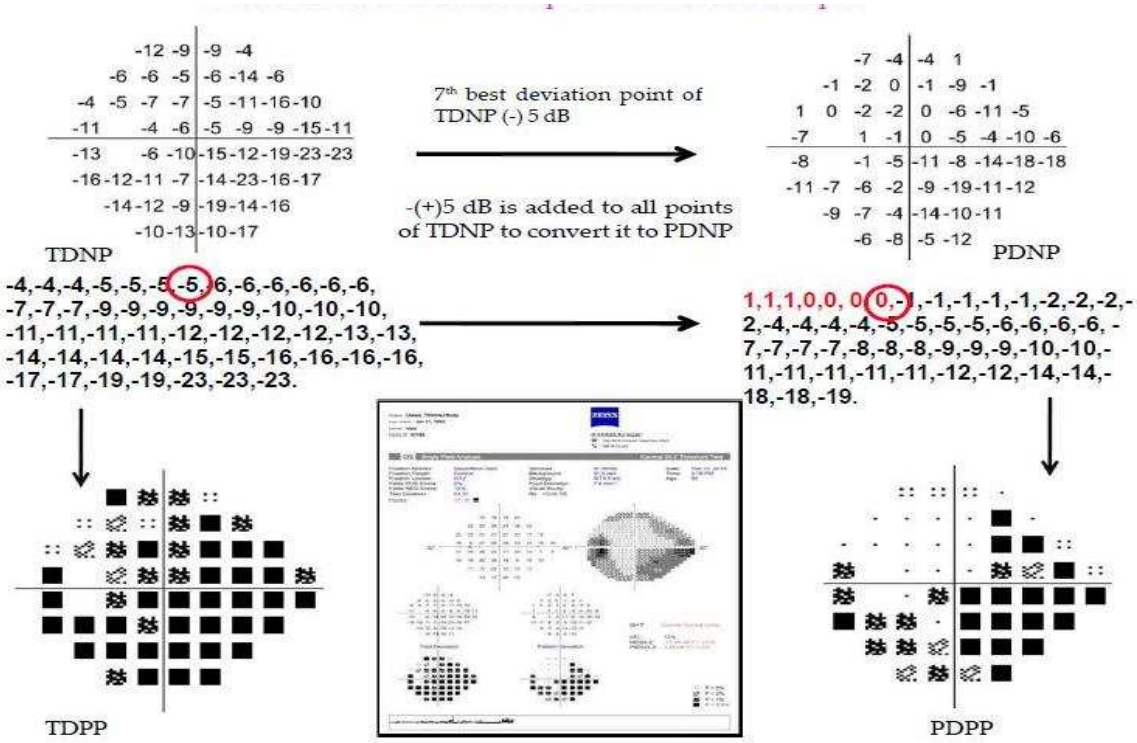


Figure 10: When we select 7th best deviation point is taken into consideration to convert TDNP to PDNP, minimum 15% of the points (shown in red colour) will not be represented by any significant P value symbol in PDPP.

If 10th point is selected as for conversion instead of 7th best deviation point for conversion of TDNP to PDNP, 10th best deviation point becomes 0 deviation point in PDNP and will be on the normal slope of hill of vision. There will be minimum 10 points of 24-2 point pattern (around 20% of the points) will not be represented by any significant P value symbol in PDPP. If 25th best deviation point is selected for conversion of TDNP to PDNP, 25th best deviation becomes zero (0) deviation point in PDNP and will be on the normal slope of hill of vision. There will be minimum 25 points of 24-2 point pattern (around 50% of the points) will not be represented by any significant P value symbol in PDPP. If we select the best deviation point towards right in the chronologically arranged deviation values plot, more percentage of points become normal ,most of the superficial scotomas (recent onset scotomas) may become nonsignificant in PDPP & hence the direction of progression may not be appreciated. That is the reason why 7th best deviation point was selected to convert TDNP to PDNP. The irregular generalized field effect shows generalized depression in

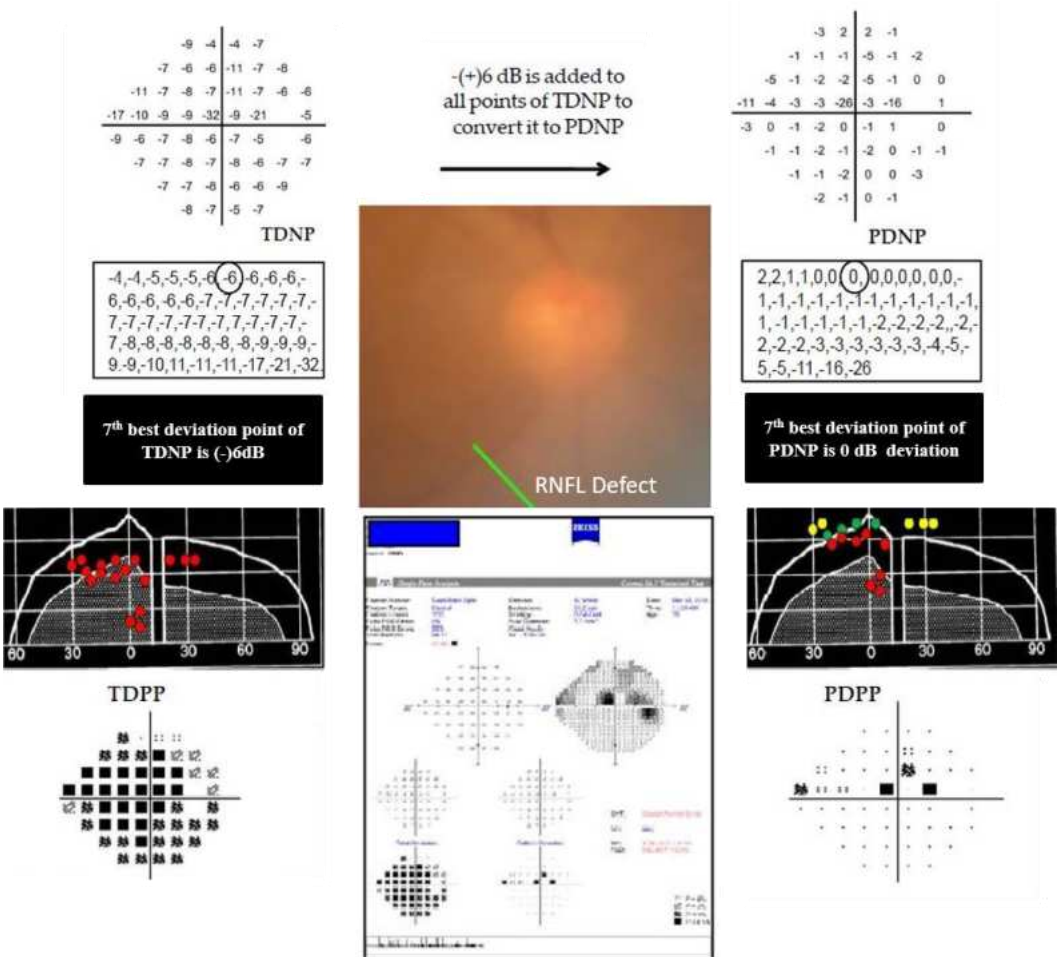


Figure 11:. Conversion of Total deviation plot to Pattern deviation plot: *While making the 7th best deviation point of TDNP to 0 deviation point the first 6 points will become either normal or better than normal in PDNP and hence not represented by any symbol in PDPP. 7th best deviation point of PDNP will be (0) and the first six will be 2,2,1,1,0,0,respectively.PDPP always has minimum 15%(7 points of 24-2 point pattern) points will be without by any P value symbol.*

TDPP with a localized field defect in PDPP (Figure 11).The field defect of glaucoma masked in generalized depression of TDPP is highlighted in the PDPP. To appreciate this localized field defect in generalized field defect, the pattern deviation plots are created. PDPP will be normal in absence of glaucoma. Each deviation value of the pattern deviation numerical plot is given a symbol on the basis of its P value and plotted as pattern deviation probability plot (Figure 11).

Total deviation probability plot with generalized depression and a normal pattern deviation probability plot indicate that it is a case of uniform generalized field defect. In such a situation always think of the conditions like cataract, media opacities, and check if the fields were done with proper refractive error correction or not. A part from glaucoma, some neurological conditions like AION, occipital lobe infarcts, etc can be diagnosed on the basis of the pattern of the field defect. When these conditions are suspected in the presence of cataract, the pattern deviation probability plot plays a major role in picking up these diseases. If the pattern deviation probability

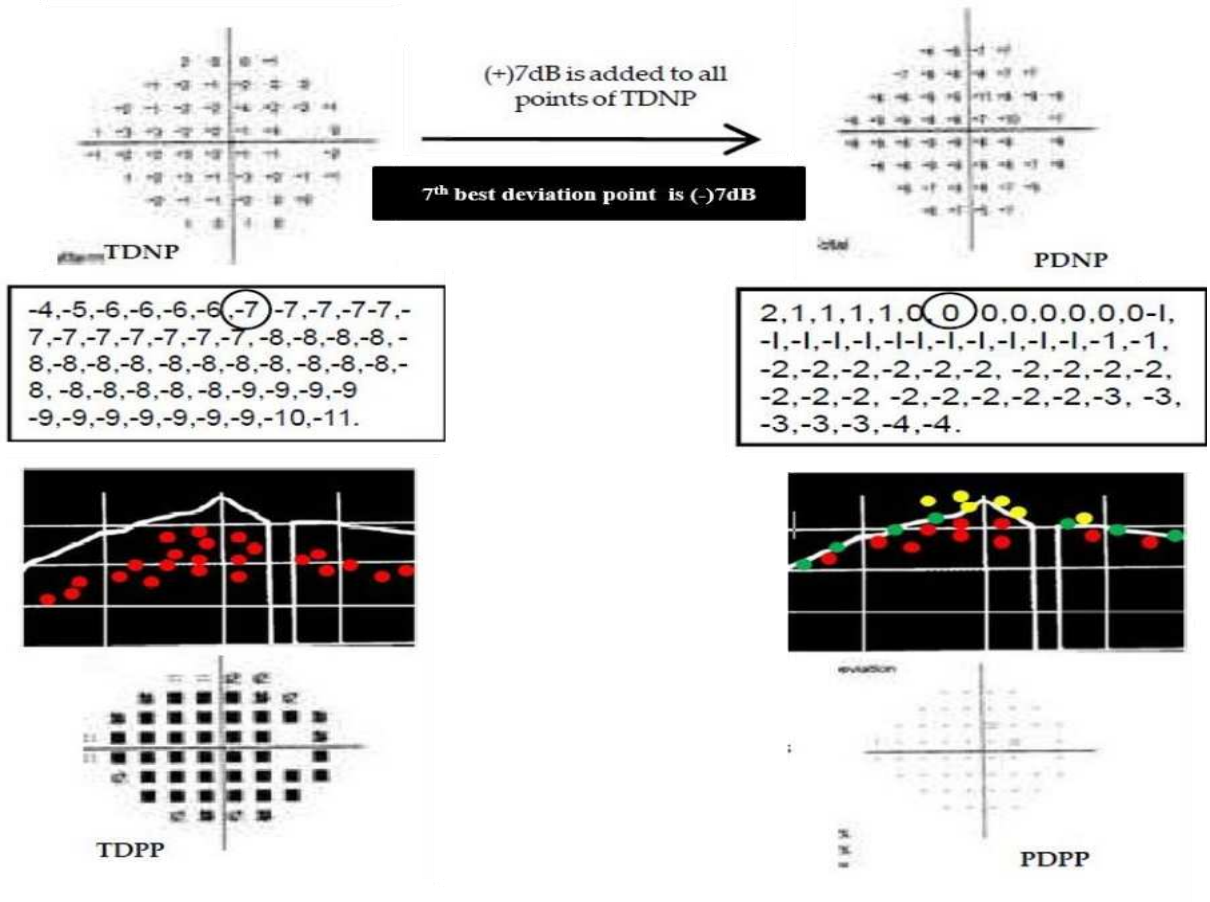


Figure 12: Uniform generalized field defects show generalized depression in TDPP with a normal PDPP. By elevating each point's sensitivity by 7dB, the 7th best sensitivity point of total deviation numerical plot comes to the normal slope of hill of vision and the first six best points of TDNP will be either on or above the normal slope of hill of vision. The remaining deviation values in PDNP are varying mostly from -1dB to -4dB deviation. So the sensitivity of most of the points of PDNP are in the normal range and hence are not represented by any significant P value symbol and thus a normal pattern deviation probability plot.

plot does not show any field defect (Uniform generalized field defect) as in this case, we can eliminate the above said conditions. If the pattern deviation probability plot shows a localized field defect (irregular generalized field defect) the diagnosis can be made depending on the pattern of the field defect.

Both probability plots (TDPP & PDPP) look similar in localized field defects as the 7th best deviation point of TDNP is either (0) or minimal deviation value (Figure 13) . Lesser dB value is added to convert TDNP to PDNP.

Hence TDNP & PDNP are identical and so are the TDPP and PDPP. Uniform generalized field defects show generalized depression in TDPP with a normal PDPP. Here the loss of retinal sensitivity is almost similar at all points, the dB value that brings the 7th best deviation point to normal slope of hill of vision will also bring all the other remaining points either to slope of hill of vision or close to it and hence are not represented any symbol in the PDPP. Irregular generalized field defect shows generalized depression in TDPP with a localized field defect in PDPP. Here the dB

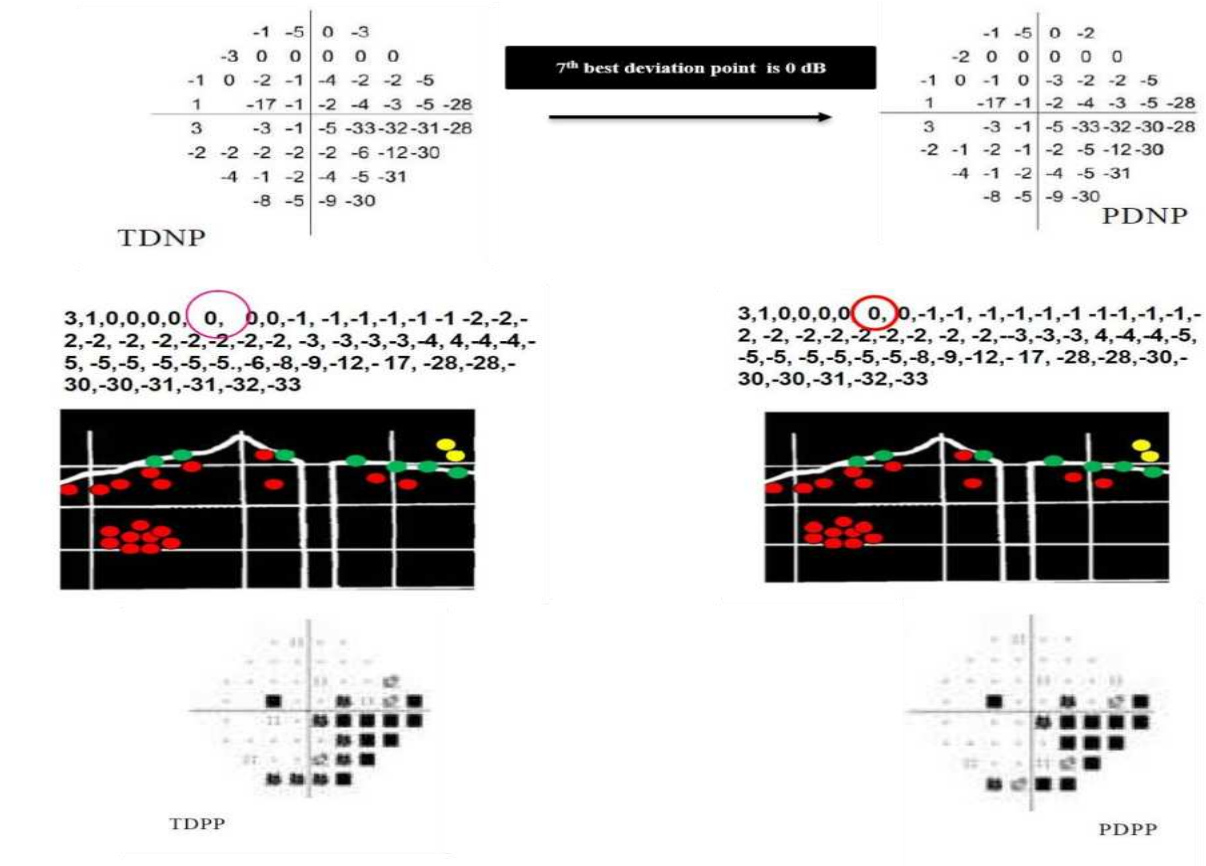


Figure 13: In this case, the deviation values of TDNP vary from 3 dB to -33 dB . The 7th best deviation value in TDNP is (0),15th best deviation value is -1 dB, and 25th best deviation value is -2 dB . In localized scotoma, the deviation values of most of the points will be minimal and hence there are close to the contour of hill of vision. In this case the 7th best deviation point is already(0)dB ,and is on the contour of hill of vision. No dB value is added during the conversion of TDNP to PDNP, So both numerical plots look similar and hence both the probability plots look similar.

value that brings the 7th best deviation point to normal slope of hill of vision, can only bring the recent onset scotomas nearer to the normal slope of hill of vision and cannot change the P values of deeper scotomas and will be highlighted in PDPP.

High false positive errors will have more number of scotomas in the pattern deviation probability plot than in the total deviation probability plot.

If the sensitivity of the 7th best deviation point of TDNP is better than normative data, it will be above the contour of hill of vision.

To bring the point to contour of hill of vision we have to decrease the sensitivity of the points. Normally during the conversion of TDNP to PDNP, the sensitivity of the points will be elevated .But in this example, since the 7th best deviation point of TDNP is +18 dB (better than normative data),the sensitivity of each point in TDNP is decreased by 18 dB or in other words a generalized depression worth of (-18 dB) is added to all the points of TDNP during its conversion to PDNP (Figure 14) . As there is decrease in sensitivity at all the points in PDNP ,we see more number of black squares in the PDPP than the TDPP. If 7th

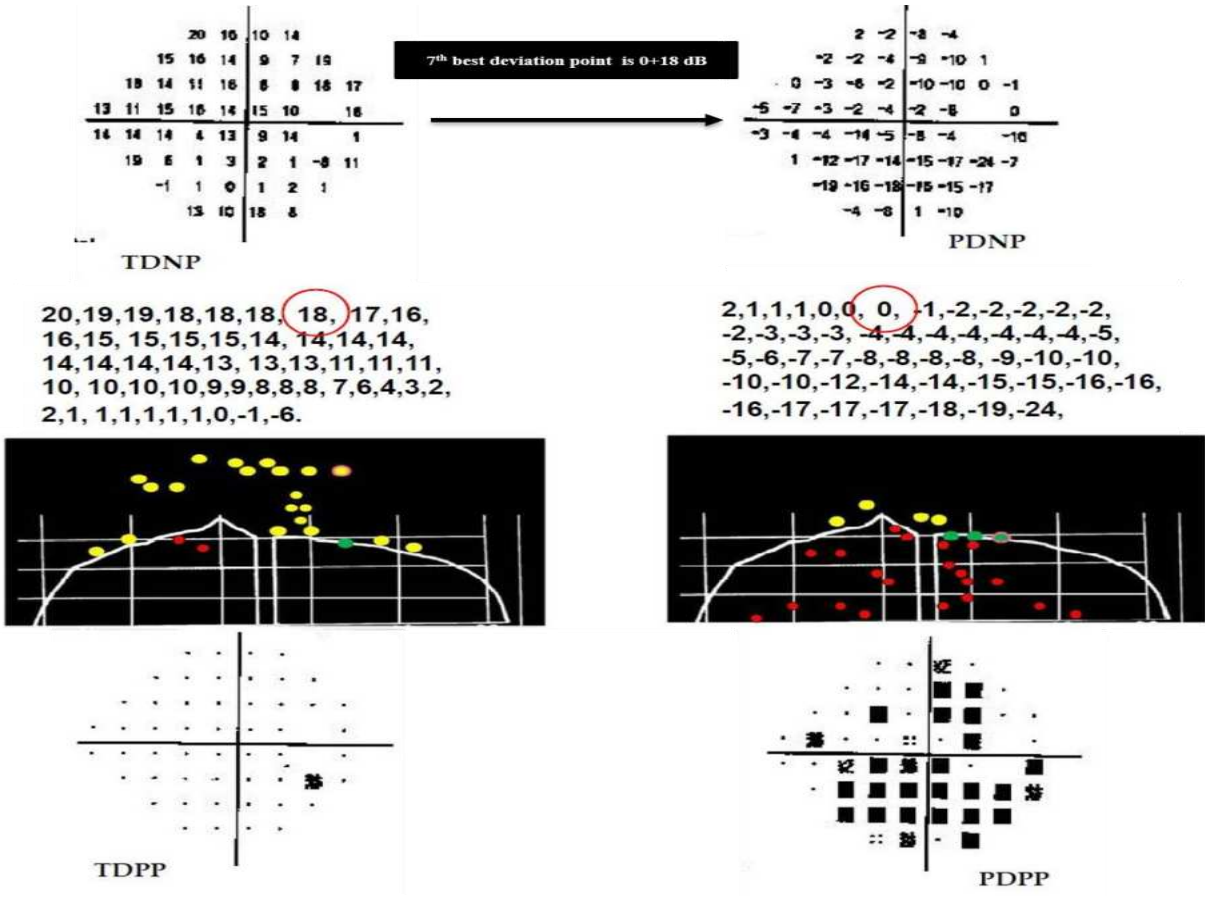


Figure 14: Though high sensitivity points are also not commonly seen, P value will not be calculated for those points The most important point to be noted is P value will be calculated only to the loss of sensitivity points. So points with abnormally high sensitivity are not represented by any P value symbol in the probability plots.

best deviation point of TDNP is better than normative data, we see more number of black squares in the PDPP than the TDPP (Figure 14).

Zone 9 global indices: 1.Mean deviation index 2.Pattern standard deviation (P 3.Visual field index (VFI)

Mean deviation index is the average of all the deviation values of the total deviation numerical plot except the deviation values of the two points in the area of the blind spot. It is an index developed to express the depth of the field defect and its value is directly proportional to the depth of the field defect. Note that that the value of M.D. index is always lesser than the exact depth of localized field defects (Figure 14).

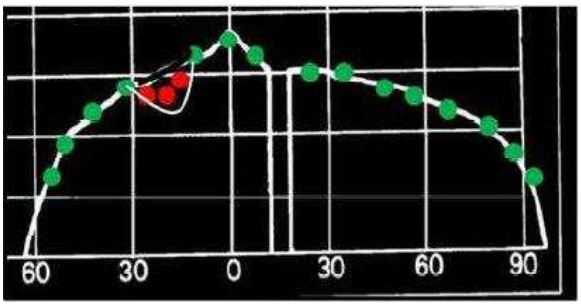


Figure 15: Hill of vision-localized field defect

Even a small increase in MD on follow up test should arise the suspicion regrading progression of the field defect. In uniform generalized field defect, MD index is true index to express the depth of the field defect and to some extent it gives true value in irregular generalized field defect (Figure 15).

PSD is an index developed from TDNP to express the contour of hill of vision whether it is smooth or irregular. In uniform

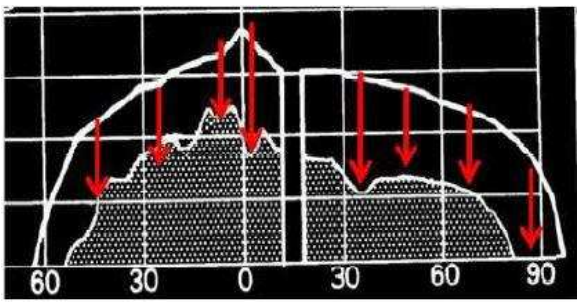


Figure 16: Hill of vision-Irregular generalized field defect

generalized depression (e.g. cataract), there is uniform loss of sensitivity affecting the height of hill of vision but not the contour of hill of vision (smooth contour is maintained). PSD will be nonsignificant. The contour of hill of vision will be affected when there is a localised or irregular generalised field defect and PSD will be significant (Figure 17). PSD is not related to the depth of field defect but only signifies the contour of hill of vision whether it is smooth or irregular scotoma .

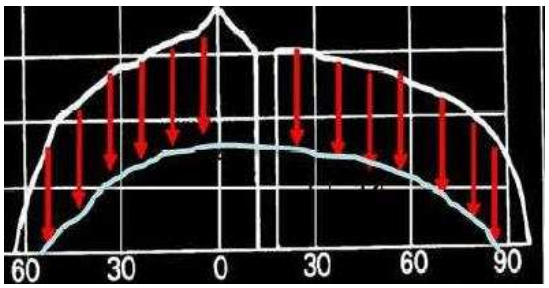


Figure 17 : Hill of vision-uniform generalized depression

In cases with early glaucoma and established cases PSD will be high or significant and is represented by P value. As the disease progresses, the sensitivity at all points will be nearing 0dB and the PSD will be low and nonsignificant. The important points to note regarding PSD are 1) It does not carry any sign in front of it. 2) It is not the index to tell

the depth or severity of glaucoma. 3) It is an index developed to pick up early localized.

Visual field index VFI is an index developed from PDNP and hence is not affected by cataract. It transposes deviations from the normative data into a percentage scale.100% means the quality of life is not affected. VFI reflects the quality of life. A certain level of the defect has to be reached to deviate the

The visual field index (glaucoma progression index)is a new perimetric index designed for two purposes 1). For calculating the rate of glaucomatous progression.(glaucoma progression analysis(GPA),This is the reason why the index is also named as glaucoma progression index) 2)To reflect quality of life . So doctors may use this for educational purposes since patients can quickly perceive with minimal explanation.

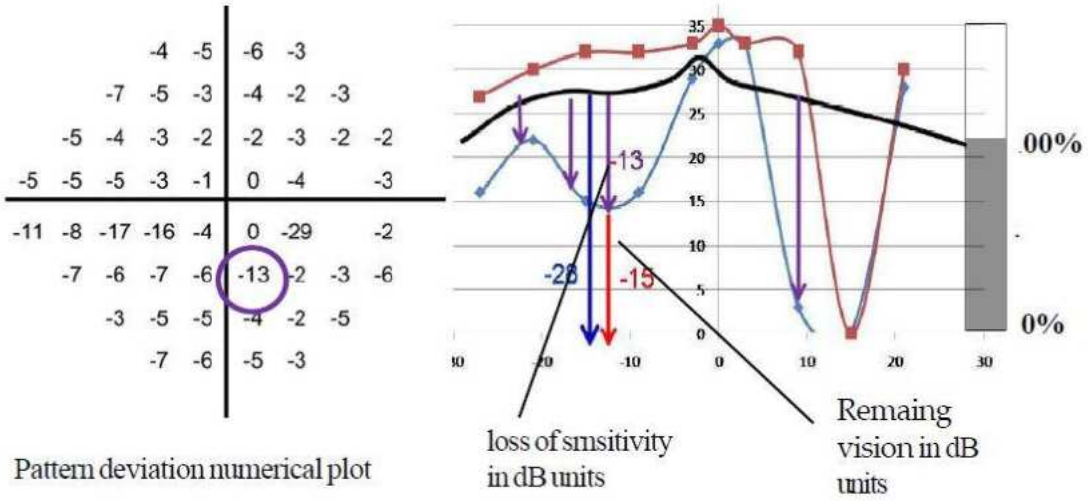


Figure 18: VFI is expressed in percentage where 100% represents a normal visual field and 0% represents a perimetrically blind field.VFI-100% means the quality of life is not affected. The VFI cannot go beyond 100%.

VFI from 100%. VFI is defined as a deviation below the 5% probability level on the pattern deviation plot. The centre of the visual field has more weight than the periphery while calculating the VFI and the index switches to the use of total deviation if the MD shows severe global visual field deviations. VFI is absent in 10-2 printout.

Zone 10 Glaucoma hemi field test (GHT): This is an index to pick up early field defect due to glaucoma. Five groups of points on either side of horizontal raphe where the glaucoma defects usually arises are designed A score assigned to each zone based on the location of the zones and their deviation values in the pattern deviation numerical

plot. A comparison of each upper zone is made with the corresponding lower zone and the difference in scores between the upper and lower zones is calculated (Figure 19).

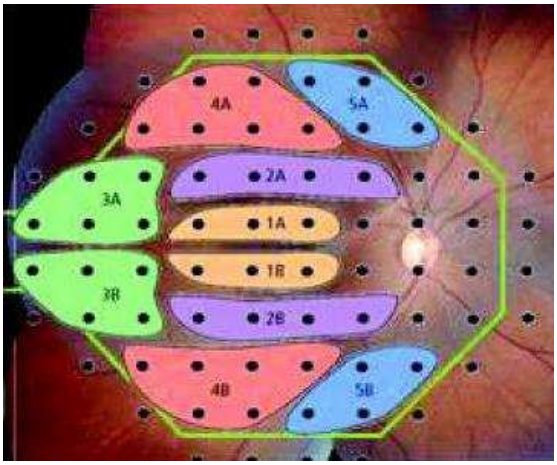


Figure 19: GHT-The outer set of points of 30-2 except the two outer most points on the nasal side are not included in the zones.

The difference is compared with significant limits taken from a data base of normal subjects. and the results are given as border line, outside normal limits, low sensitivity, abnormally high sensitivity and within normal limits. GHT is absent in 10-2 printout. With the above information one can diagnose glaucoma suspect at an early stage using the Anderson's criteria.

Anderson's criteria: Any localized scotoma to be labelled as glaucomatous field defect, it must fulfil certain **criteria** .These criteria are called as **Anderson's criteria**. So one should know about **Anderson's criteria.** localized field defect -Concentrate on the total deviation probability plot Generalized field defect- Concentrate on the pattern deviation probability plot.

1. Three non-edge cluster points of either total deviation probability plot (localized field defects) or in pattern deviation probability plot (in generalized field defect) of 30-2 with 2 points have P value < 5% and one point P value < 1%
2. PSD P< 5%
3. GHT Outside normal limits.

Selection of the point patterns

The outer set of points except the two nasal points on either side of horizontal axis are eliminated from the 30-2 point pattern to form 24-2 point pattern. 54 points in 24-2 point pattern (Figure 20).

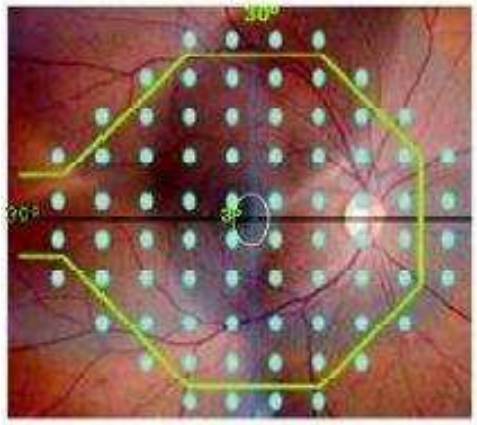


Figure 20: Pattern of points in 30-2 and 24-2.

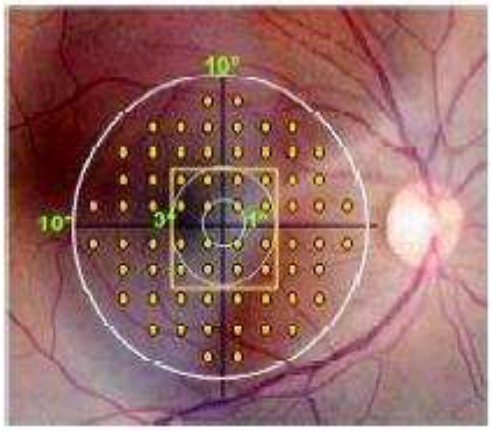


Figure 21: Pattern of points in 10-2

From this flow chart (Figure 21) it is very visual field testing starts with 30-2 or 24 -2 point pattern in a case of glaucoma. If there is an indication for 10-2 printout, repeat the test with 10-2 printout.

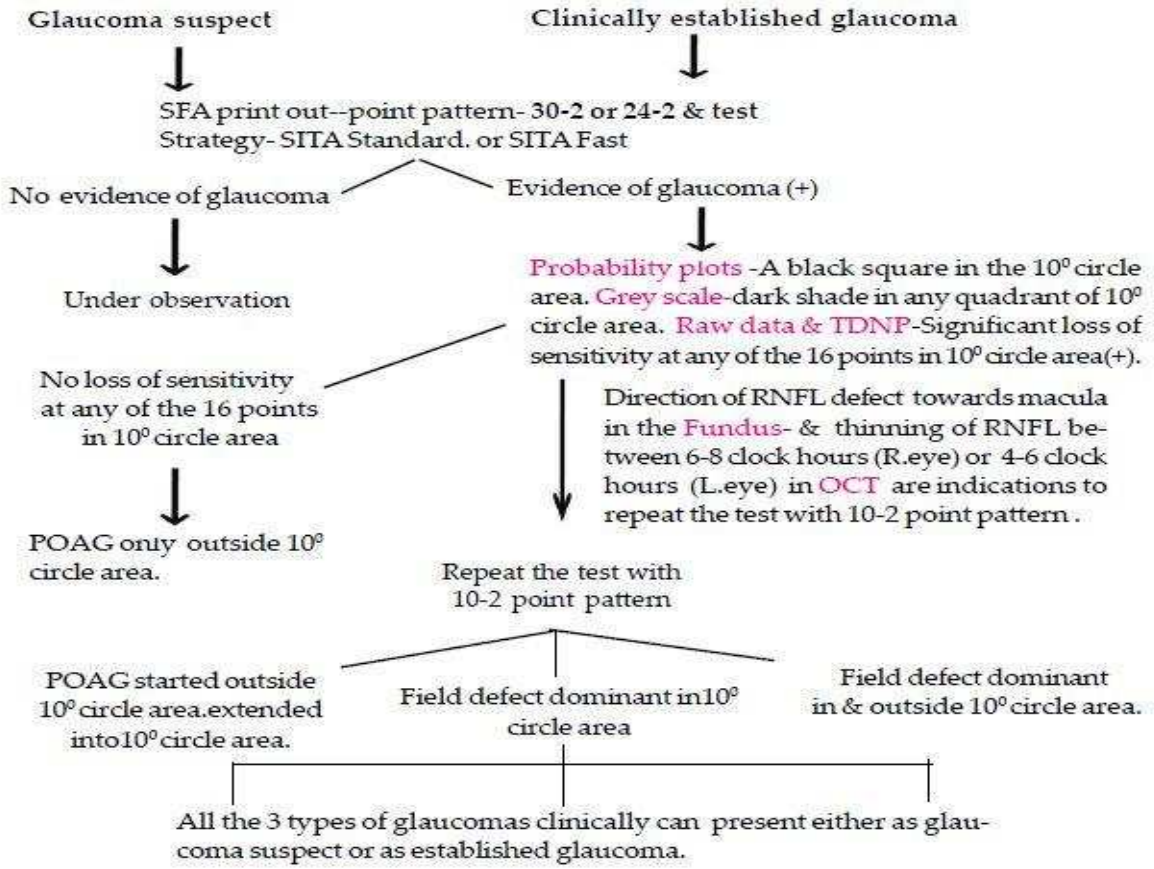


Figure 22: Flow chart for approach for selecting visual field test in glaucoma suspect and in an established case of glaucoma

Important clues during interpretation of visual field defects

Make sure that the test is done with correct point pattern. In a case of glaucoma either suspect or established, the test should be done with **30-2 or 24-2** point pattern. The indications to repeat the test with 10-2 point pattern are 1) Probability plots -A black square in the 100 circle area. 2)Grey scale dark shade in any quadrant of 10 degree circle area. 3) Raw data & TDNP-Significant loss of sensitivity at any of the 16 points in 10 degree circle area (+) 4) Fundus-Direction of RNFL defect towards macula 5) OCT- thinning of RNFL between 6-8 clock hours (right eye) or 4-6 clock hours (left eye). Make sure the patient data and the test data are properly fed to the field analyser by the technician as per the order form. Always put foveal threshold "ON" which correlates with visual acuity. Good foveal sensitivity should have good visual acuity and vice versa. If not correlating check if the refraction for near is accurate or if the patient has understood the method to perform the test. Never interpret visual

fields in isolation It should always be correlated with fundus. Meticulous fundus examination is a must to identify non glaucomatous field defects .Picking up finding like disc pallor exceeding the cup, optic disc pit, tilted disc and proper evaluation of myopic disc help to identify non glaucomatous field defects Identification of the artifacts due to small pupil (< 3 mm),improper refractive error correction, fixation losses, false positive errors, false negative errors, dim bulb, rim artifacts is the most important step in the interpretation of SFA print out especially in a suspected case of glaucoma. If loss of sensitivity is significant among the central 16 points of 24-2, repeat the test with 10-2 point pattern.

Visual field dependent factors to set lower target IOP

1. Location & extent of the field defect: If glaucomatous field defect is either originating outside 240 and extended into 100 circle area or the starting within 100 circle.
2. Direction of the field defect - direction of progression towards fixation.
3. Depth of the field defect: presence of absolute scotoma (non-edge point) MD index represents the depth of the field defect. Do not grade glaucoma on MD index. Presence of a field defect within 100 circle area and direction of progression towards fixation even with low MD index needs low target IOP. One need not aim at lower target IOP even with higher MD index in the absence of field defect within 10 degree circle area or progressing away from fixation.

During interpretation of probability plots always see both the probability plots as a single unit. This is one of the most important points in the interpretation of visual fields of 3 cases, will be discussed.

Case 1: Location, extent & direction of progression of the field defect- Glaucoma originating as a localized field defect in the upper nasal quadrant with most of the points represented by P <0.5% (black square).When all points in the field defect in

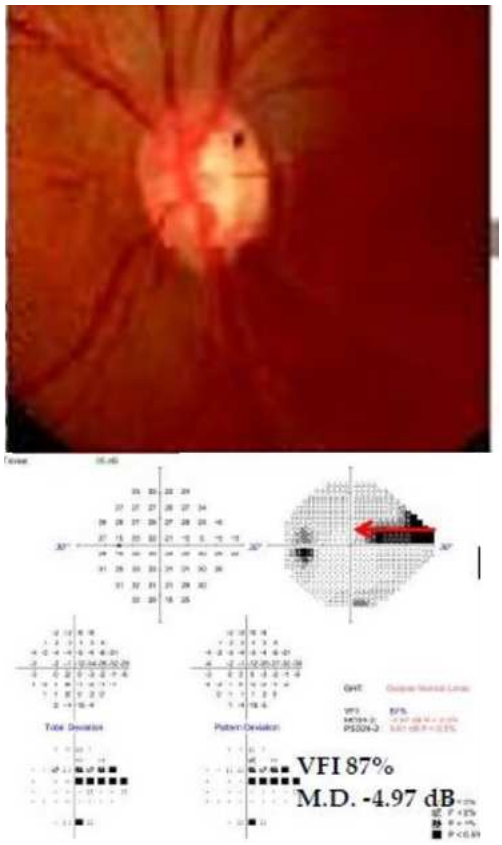


Figure 23 A- Localized field defect in the upper nasal quadrant

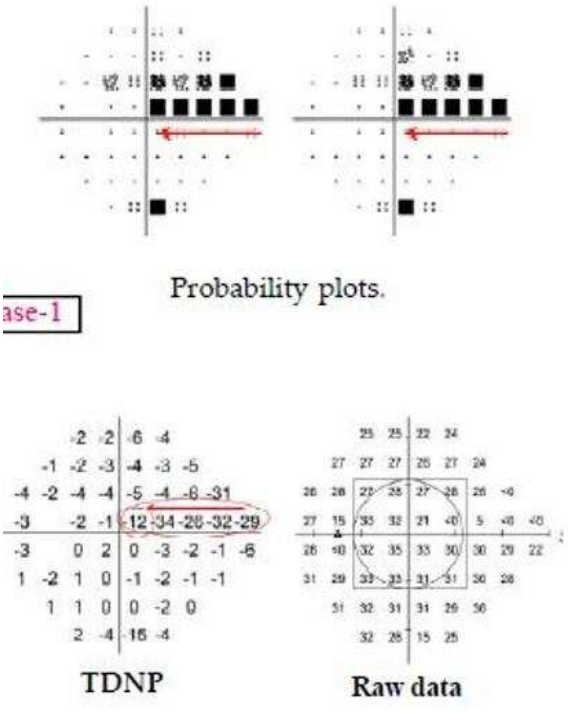


Figure 23 B- TDNP gives a clue to assess the direction of progression. From the TDNP it is very clear that the field defect started outside 10 degree circle and is progressing towards fixation

both the probability plots are represented by black squares, it is difficult to tell the direction of progression from the probability plots. TDNP gives a clue to assess the direction of progression. From the TDNP it is very clear that the field defect started outside 10 degree circle and is progressing towards fixation because the loss of sensitivity at the points outside 10 degree circle is around 30 dB & the loss of sensitivity at 30 upper nasal point is 12 dB . So we have to correlate both the probability plots and TDNP to know the direction of progression of the field defect. The direction of progression of the field defect towards fixation is not a good sign. We have to aim for low target IOP.

Depth of the scotoma: Loss of sensitivity at most of the points of the scotoma is around 30 dB . Here MD index is -4.97dB and P<0.5%. In localized scotomas MD index is not a true index to represent depth of the scotoma. Foveal sensitivity & Raw data- Foveal sensitivity is 35 dB & the field defect shows absolute scotomas. There is one absolute scotoma among the 16 points in the 10 degree circle. Repeat the test with 10-2 point pattern to know the sensitivity of the points in the macular area. In this case though the MD index is -4.97 dB P<0.5%, the current IOP is causing absolute scotomas, and is progressing towards fixation and field defect in 10-2 (minimal loss of sensitivity within 10 degree circle area will be better in probability plots than grey scale) & keeping the age of the patient (52yr.) in mind, aim for low target IOP (Figure 24).

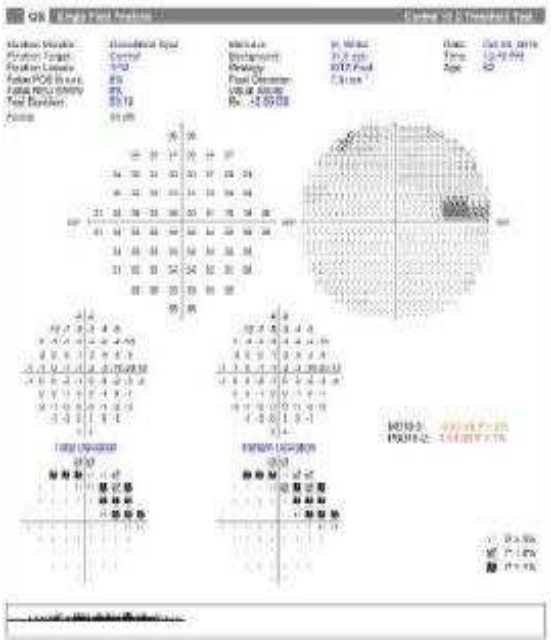


Figure 24: There is one absolute scotoma among the 16 points in the 10 degree circle.

The most important point in this case is to identify the location of origin of glaucoma. Identification of absolute scotomas within the 10 degree circle & one among the three is on the 3 degree circle point. It indicates glaucoma started close to fixation and progressing outwards. To know the exact extent & depth of the field defect, repeat the test with 10-2 point pattern. The 24-2 VFI misguides the treatment approach **in POAG with field defects dominant inside 10 degree circle area** .

As the field defect is progressing between 3 degree & 9 degree points, the field defect is not well appreciated in the in the upper temporal area within the 10 degree circle area of 24-2 -grey scale. **In POAG with field defects dominant inside 10 degree circle area.** 10-2 MD index (-9.85dB) will be always more than 24-2 MD index (-8.18 dB) The 24-2 VFI 79% misguides the treatment approach in type of glaucoma as VFI is not calculated in 10-2 SFA printouts (Figure 25) . Low target IOP must be aimed & if needed surgical approach may be indicated **POAG associated with field defects dominant inside 10 degree circle area** (Figure 26).

Localized scotomas: A case with two localized scotomas, one in lower nasal quadrant outside 10 degree circle area and the second one in upper nasal quadrant within 10 degree circle area are appreciated in the grey scale than in the probability plots (Figure 27).

Raw data: The black square in the upper nasal quadrant in 10 degree circle area is an absolute scotoma and is an indication to repeat the test with 10-2 point pattern. The lower nasal quadrant outside 10 degree circle area is almost absolute field defect (Figure 27). 24-2 MD index is -13.37 dB and 24-2 VFI is 69% VFI is not calculated in 10-2 program.

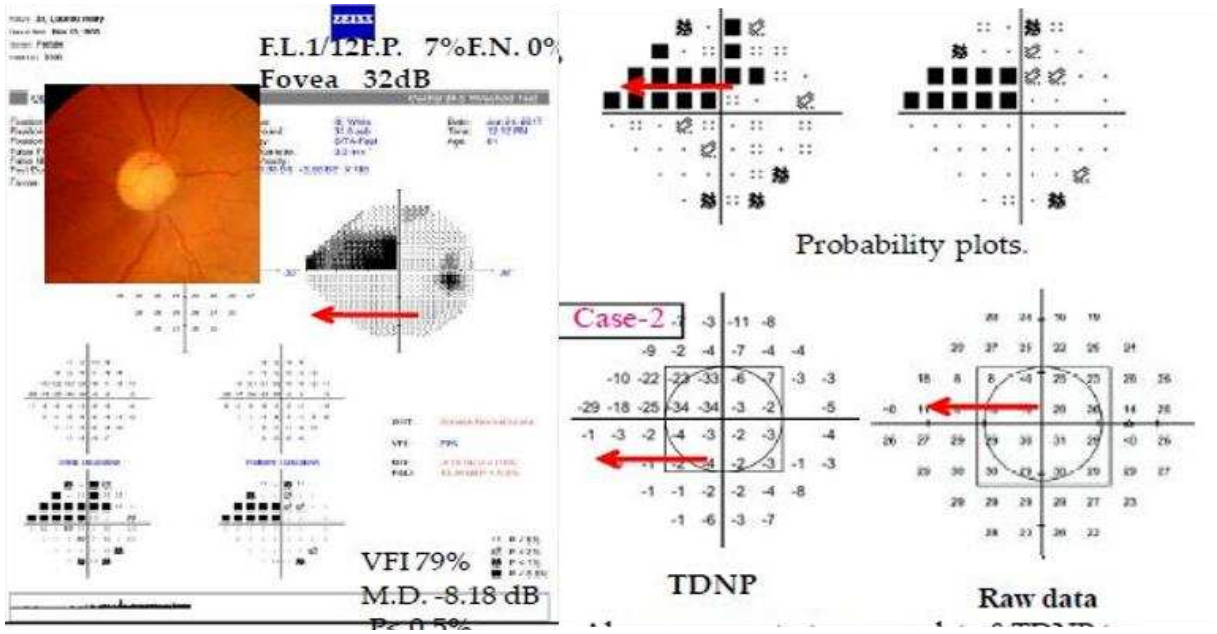


Figure 25: Identification of absolute scotomas within the 10 degree circle & one among the three is on the 3 degree circle point.

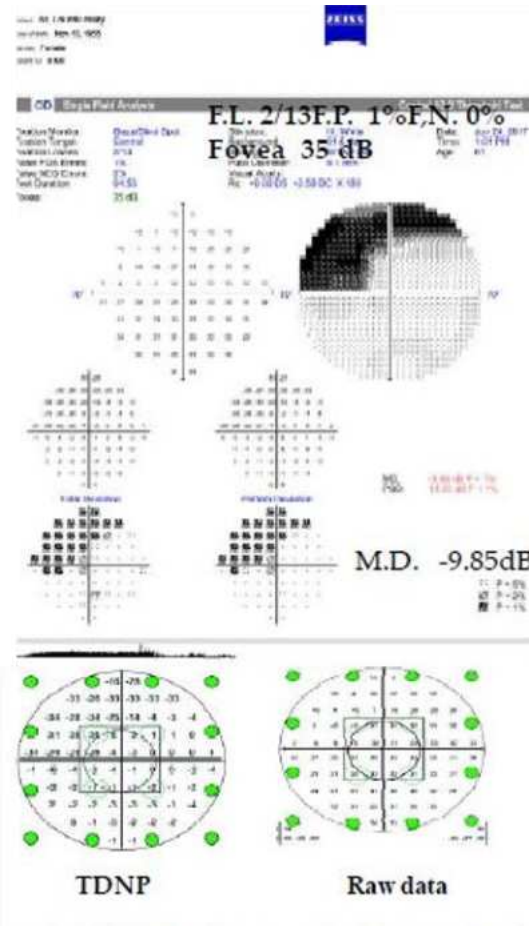


Figure 26: Field defect dominant inside 10 degree circle area

Remember that the progression of glaucoma starting in 10 degree circle cannot be analysed on the basis of change in VFI. Progression analysis for glaucoma starting in 10 degree circle will be calculated on the basis of change in MD index. In this case glaucoma started in & outside central 10 degree circle.

Note in figure 28, that the extent of the 3 black squares in the 10 degree circle area in 24-2 program will be better appreciated in 10-2 program. The progression of the field defect into lower nasal quadrant in central 10 degree area is better appreciated in the probability plots than in the grey scale.

Concentrate on the 16 points in the 10 degree circle area in 24-2 point pattern to know whether the test should be repeated with 10-2 point pattern or not. Concentrate on the 16 points in the 3 degree circle area in 10-2 point pattern to assess foveal status. In this case the field defect extended into 3 degree circle. Maintain very low target IOP till surgery is planned.

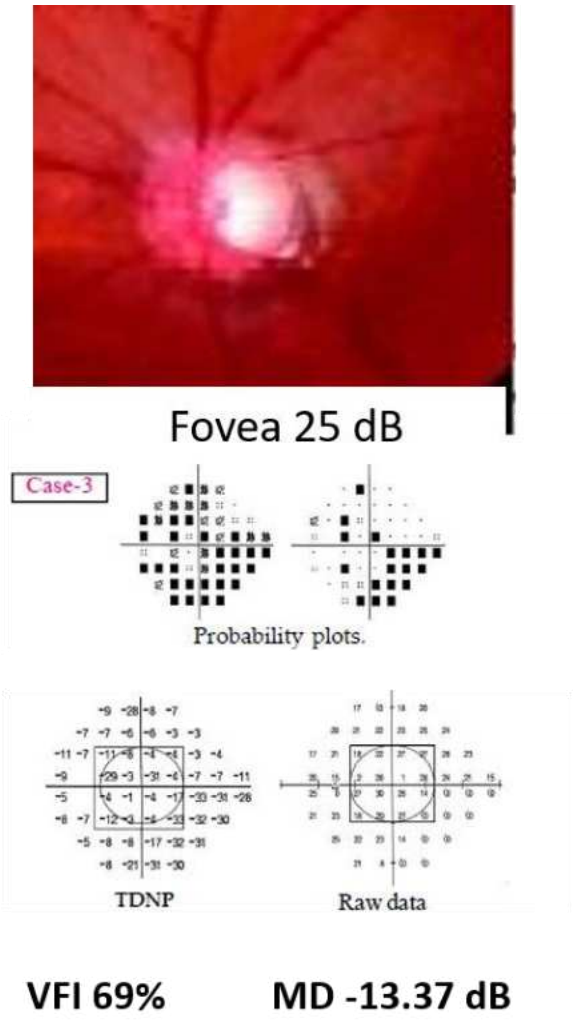


Figure 27: Two localized scotomas

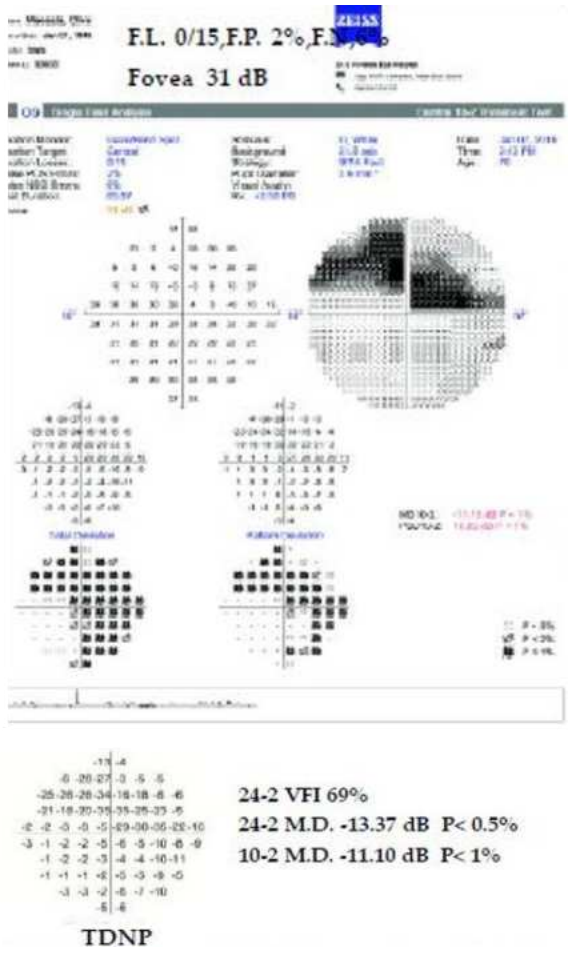


Figure 28: Field defect dominant in central 10 degree

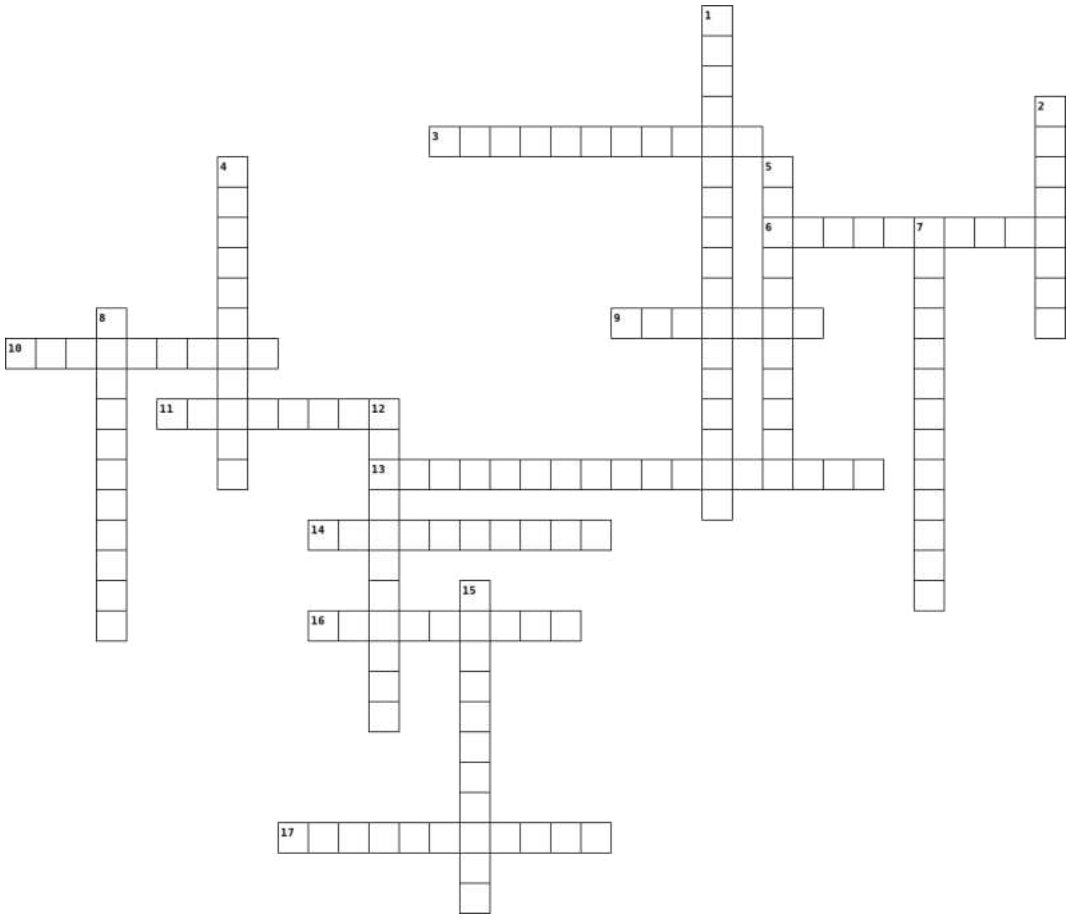
The article by Dr GR Reddy, is published from the book , Practical Guide to Interpret Visual Fields, with permission from Jaypee Brothers Medical Publishers.

GSI News

Glaucoma Society of India

- GlaucoLuit 2020, the annual meeting of Glaucoma Society of India, scheduled to be held in September 2020 at Guwahati was cancelled due to COVID 19 pandemic. However, a virtual meeting GLAUCOVAGANZA 2020 is scheduled for September 20' 2020.
- Online GSI election held between September 7-13'2020. Nearly 72% of the members excersied their vote.
- Dr SS Pandav, a renowned academician from PGIMER Chandigarh will take over as next President of the GSI.
- Well known glaucoma specialist Dr B Sridhar Rao passed away on August 9'2020.
- The World Glaucoma Congress has been rescheduled for September 2021. The postponement was due to COVID pandemic.
- Glaucoma society of India page now can assessed on you tube and Facebook. For more updates on glaucoma news, click to https://glaucomasociety.in/

GLAUCOMA CROSSWORD-2



ACROSS

3. Enlarged under pressure
6. Suddenly closes angles and makes myopic
9. Longest serving agent
10. Map the whole area automatically
11. Absent or poorly developed iris
13. Snow has fallen all around
14. Once opened, demand coolness
16. I am selective and safe
17. Blunts the spike

DOWN

1. Characterised by small and spherical lens
2. Canal in eye
4. Makes pupil pin point
5. Need refrigeration for prolonged storage
7. Uses all routes to enter and abort the acute attack.
8. New entrant in family
12. I set the standard
15. Avoid me if you have sulpha allergy

Contributed by:
-Dr Ashutosh Ganeshpuri Jaiswal
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Institutes offering various glaucoma training/fellowship opportunities in India

	Hospital/Institute Name	**Contact email**
1.	Advanced Eye Center, Postgraduate Institute of Medical Science & Research, Chandigarh	pgimer-chd@nic.in
2.	Ahalia foundation eye hospital, Palakkad (Kerala)	administrator@afeh.org
3.	Aravind postgraduate institute of ophthalmology, Madurai (Tamilnadu)	aravind@aravind.org
4.	B W Lions super speciality hospital, Bengaluru (Karnataka)	lionseye@vsnl.com
5.	CU Shah ophthalmic PG training centre (Sankara Netharalya) Chennai (Tamilnadu)	academics@snmail.org
6.	Chaithanya eye hospital & research institute, Thiruvanathapuram (Kerala)	chaithanyaeye@gmail.com
7.	Divyajyoti trust, Mandvi (Gujrat)	divyajyoti.icare@gmail.com
8.	LV Prasad eye institute, Hyderabad	education@lvpei.org
9.	Laxmi eye institute, Panvel (Maharashtra)	hr@laxmieye.org
10.	Lotus eye hospital, Mumbai (Maharashtra)	lotuseyehospital@mtnl.net.in
11.	Narayana Nethralaya, Bengaluru (Karnataka)	fellowship@narayananethralaya.com
12.	National institute of Ophthalmology, Pune(Maharashtra)	administrator@nioeyes.com
13.	Nethradhama super speciality eye hospital, Bengaluru (Karnataka)	hrd@nethradhama.org
14.	Prabha Eye Clinic & Research Center, Bengaluru (Karnataka)	info@prabhaeyeclinic.com
15.	Regional institute of ophthalmology, Sitapur (UP)	madhu.bhadauria@gmail.com
16.	Sadguru Netra Chikatsalya, Chitrakoot (Madhya Pradesh)	sssst@sadgurutrust.org
17.	Sankar foundation eye hospital & institute of ophthalmology, Vishakhapatanam (AP)	training@sankarafoundation.in
18.	Sankara eye foundation, Coimbatore	carriers.seci@sankaraeye.com
19.	Shanti Saroj nethralaya, Miraj (Maharashtra)	sharadbhomaj@gmail.com
20.	Shri Ganpati nethralaya, Jalna (Maharashtra)	abhishekh.desai@netralaya.org
21.	Suraj eye institute, Nagpur (Maharashtra)	surajeyeinstitute@gmail.com
22.	Dr Sharoff's charity eye hospital, New Delhi	training@sceh.net
23.	Dr Thakorbhai V Patel eye institute, Vadodara (Gujrat)	tvpeyeinstitute@yahoo.com
24.	Venu eye institute and research centre, New Delhi	education@venueyeinstitute.org

Useful resources

www.glaucomasociety.in for all information about Glaucoma Society of India and GIEPs (Glaucoma India education programmes)

www.eugs.org for terminology and guidelines for glaucoma (EGS **Guidelines** 4th Ed)

www.nice.org.uk/ guidance for NICE (National Institute for Health and Care Excellence) guidelines for glaucoma

www.aao.org for preferred practice pattern in glaucoma

www.gonioscopy.org the online resource for Glaucoma curriculum maintained by University of Iowa. Consists of 50 chapters with more than 90 video clips and 900 images, also maintains an atlas of Gonioscopy with basic and advanced examination techniques

https://wga.one/wga/basic-course-in-glaucoma/ and https://wga.one/wga/continued-education-in-glaucoma-modules/ for online courses in Basic aspects and advanced modules in Glaucoma under the aegis of World Glaucoma Association

www.apglaucomasociety.org for information and guidelines by Asia pacific glaucoma society

https://www.nei.nih.gov/learn-about-eye-health/resources-for-health-educators/glaucoma-resources to get access to handouts and patient education materials, videos and webinars

https://www.glaucomaphysician.net/ online magazine published quarterly that deals with case studies, surgical techniques, research, and clinical discussions on glaucoma patient management

Upcoming events

Annual virtual meeting of GSI: 20th September 2020

14th European Glaucoma Society Congress :14th-16th December, Brussels, Belgium

Asia Pacific Glaucoma Congress :13th – 15th August 2021

9th World Glaucoma Congress: 9th to 12th Sept 2021 Kyoto, Japan

Tips for practice

- Check for signs of ocular surface disease routinely in glaucoma patients on topical treatment. Dry eye is most common known side effect of anti-glaucoma medications.
- It is important to rule out intracranial pathology from normal tension glaucoma. Consider neuroimaging in patients of normal tension glaucoma whenever there is monocular loss of visual acuity in the absence of advanced cupping or other ocular pathology, monocular loss of color vision, visual field loss that is not consistent with glaucomatous nerve fiber layer loss, rapidly progressing optic nerve disease in the presence of good IOP control, optic disc pallor, especially the neuroretinal rim.
- Patients of ocular hypertension with pseudoexfoliation are at significant risk of converting to glaucoma. During clinical examination, an active search for signs of pseudo-exfoliation must be done.
- Cardiac failure is neither a contraindication to beta-blocker therapy nor it worsen with beta blocker therapy. Topical beta blocker is contraindicated in patients with sinus bradycardia and arrythmia (second or third degree atrioventricular block)
- Alopecia is rare unpredictable adverse effect of topical beta blockers and can occur at any age. Hair loss starts from 1 to 24 months after initiating treatment, returns to normal 4-8 months after stopping treatment.
- Always keep a watch on fellow, non-progressing eye through structural imaging, when following the progressing eye.
- Whenever prescribing two or more eye drops to patients, instructs them to keep a gap of at least 5 minutes between instillation of two drops. This prevents spill over of first drug and improves its bioavailability.

Contributed By- Dr Priya D, MRC Eye Hospital, Mysore

Source: EGS Newsletter -"Pearls from EGS Guidelines & Tip of the month"

Write to us

This is your space. Send your feedback and comments. These will be published in next issue of Newsletter.

If there is glaucoma fellowship opportunity in your institute, share details with us. We would publish this under our column "Training Opportunities in India".

Contact us on gsinewseditor@gmail.com

Noteworthy Publications

Reoperations for Complications Within 90 Days After Glaucoma Surgery

Objective: To describe reoperations in the operating room for complications encountered within 90 days after glaucoma surgery at a single institution over a 2-year period.

Design: Retrospective case series.

Subjects: Adult patients who have undergone glaucoma surgery including a tube shunt, trabeculectomy with mitomycin C, trabectome, or transcleral cyclophotocoagulation from June 1, 2015 to August 30, 2017 at a single institution.

Methods: These patients were then examined for postoperative complications that required reoperations within the first 90 days including revision of the tube shunt, revision of the trabeculectomy, drainage of the choroidal, or placement of a tube shunt.

Main Outcome Measures: Percentage of reoperations for complications within the first 90 days after glaucoma surgery and surgical indications for these reoperations.

Results: A total of 622 glaucoma procedures were performed on 600 eyes in 525 patients over a 2-year period from June 1, 2015 to June 30, 2017 by 4 glaucoma surgeons at a single institution. Of these, 275 (44%) were trabeculectomy with mitomycin C, 253 (41%) were the placement of a tube shunt, 33 (5%) were cyclophotocoagulation, and 61 (10%) were trabectome procedures. Postoperative complications requiring reoperations within 90 days developed in 15 patients (2.4%) overall including 7 patients (2.5%) in the trabeculectomy with mitomycin C group and 8 patients (3.1%) in the tube shunt group. Five patients developed bleb leaks, 3 patients developed serous choroidal effusions, 3 patients had tube exposure, 1 patient had tube retraction, 1 patient had persistent iritis from iris touching the tube, and 1 had encapsulation around the tube. The rate of reoperation for complications was similar between the tube group and the trabeculectomy group (P=0.67, $\chi 2$ test). There were no complications requiring reoperations in 90 days for transcleral cyclophotocoagulation or trabectome.

Conclusions: Early postoperative complications requiring reoperations within the first 90 days after glaucoma surgery were low and comparable with previous studies. Common indications for reoperation within 90 days include wound leak and tube shunt-related issues.

Source: Chu CK, Liebmann JM, Cioffi GA, Blumberg DM, Al-Aswad LA. Reoperations for Complications Within 90 Days After Glaucoma Surgery. *J Glaucoma*. 2020;29(5):344-346. doi:10.1097/IJG.0000000000001484

Long-term outcome of low-cost glaucoma drainage device (Aurolab aqueous drainage implant) compared with Ahmed glaucoma valve

Purpose: To compare the long-term outcome of Aurolab aqueous drainage device (AADI) and Ahmed glaucoma valve (AGV).

Method: Retrospective analysis of patients with refractory glaucoma who underwent AGV (AGV-FP7) and AADI (AADI Model 350) implantation. The outcome measures were intraocular pressure (IOP), requirement of antiglaucoma medications (AGMs) and re-surgery for IOP control. The postoperative complications were classified as early (≤3 months), intermediate (>3 months to ≤1 year) or late (>1 year).

Results: 173 patients (189 eyes) underwent AGV implantation (AGV Group) while 201 patients (206 eyes) underwent AADI implantation (AADI

group). The IOP in AADI group was significantly lower than AGV group at all time points till 2 years and comparable at 3 years. AADI group had significantly higher number of AGM in preoperative period and significantly lower number in postoperative period till 3 years compared with AGV group. AADI group had more hypotony-related complications but statistically insignificant (p = 0.07). The surgical interventions were significantly higher in AGV (n = 18) compared with AADI group (n = 5) in late postoperative period (p = 0.01). At 3 years, overall success was seen in 58.18% in AGV and 73.08% in AADI group (p = 0.15). Complete success was seen in 7.27% patients in AGV and 25.00% patients in AADI group (p = 0.02).

Conclusion Both AADI and AGV implant had comparable mean IOP at 3 years with lesser requirement of AGM in the AADI group. Both procedures appear to be safe with slight preponderance of hypotony-related complications in AADI group.

Source: Pandav SS, Seth NG, Thattaruthody F, et al. Long-term outcome of low-cost glaucoma drainage device (Aurolab aqueous drainage implant) compared with Ahmed glaucoma valve. *Br J Ophthalmol*. 2020;104(4):557-562. doi:10.1136/bjophthalmol-2019-313942

Predictors of Long-Term Visual Field Fluctuation in Glaucoma Patients

Purpose: To identify predictive factors for visual field (VF) fluctuation in glaucoma patients.

Design: Retrospective cohort study.

Participants: A total of 1392 eyes (816 patients) with 6 or more VFs and 3 years or more of follow-up.

Methods: For each eye, the VF mean deviation (MD) and the pointwise sensitivities were regressed against time to model the series trend, and the root mean square error (RMSE) was estimated as a measure of variability. Potential predictors were selected with least absolute shrinkage and selection operator regression and included eye laterality, ethnicity, glaucoma type, intraocular pressure (IOP) fluctuation, baseline best corrected-visual acuity, intervening cataract or glaucoma surgery, length of follow-up, frequency of testing, baseline MD, rates of VF progression, and median false positive (FP) and false negative (FN) responses.

Main Outcome Measures: Predictors of global and pointwise VF long-term fluctuation.

Results: In the global model, left eye (0.063 dB; P = 0.022), Asian descent (0.265 dB; P = 0.006), larger IOP fluctuation (0.051 dB; P < 0.001), intervening cataract surgery (0.090 dB; P = 0.023), longer follow-up (0.130 dB; P < 0.001), worse baseline MD (–0.145 dB; P < 0.001), faster VF decay rate (–0.090 dB; P < 0.001), and higher FP rate (0.145 dB; P < 0.001) and FN rate (0.220 dB; P < 0.001) were predictors of VF fluctuation. In the pointwise model, larger IOP fluctuation (0.039 dB; P = 0.022), longer follow-up (0.340 dB; P < 0.001), higher VF frequency (0.238 dB; P = 0.002), intervening glaucoma surgery (0.190 dB; P = 0.01), worse baseline MD (–0.535 dB; P < 0.001), faster VF decay rate (–0.340 dB; P < 0.001), and higher FP rate (0.255 dB; P < 0.001) and FN rate (0.395 dB; P < 0.001) were associated with increased fluctuation. The multivariable model explained 57% and 28% of the pointwise and global variances, respectively.

Conclusions: This study identified novel predictors of VF fluctuation, and explains nearly 60% of the pointwise variance. In the presence of factors predictive of high fluctuation, increased frequency of testing and better analytics will help to identify VF progression more accurately.

Source: Rabiolo A, Morales E, Kim JH, et al. Predictors of Long-Term Visual Field Fluctuation in Glaucoma Patients. *Ophthalmology*. 2020;127(6):739-747. doi:10.1016/j.ophtha.2019.11.021

Point-wise correlations between 10-2 Humphrey visual field and OCT data in open angle glaucoma

Source: Cirafici, P., Maiello, G., Ancona, C. *et al.* Point-wise correlations between 10-2 Humphrey visual field and OCT data in open angle glaucoma. *Eye* (2020).
https://doi.org/10.1038/s41433-020-0989-7

Purpose: Optical Coherence Tomography (OCT) is a powerful instrument for helping clinicians detect and monitor glaucoma. The aim of this study was to provide a detailed mapping of the relationships between visual field (VF) sensitivities and measures of retinal structure provided by a commercial Spectral Domain (SD)-OCT system (RTvue-100 Optovue).

Methods: Sixty-three eyes of open angle glaucoma patients (17 males, 16 females, and mean age 71 ± 7.5 years) were included in this retrospective, observational clinical study. Thickness values for superior and inferior retina, as well as average values, were recorded for the full retina, the outer retina, the ganglion cell complex, and the peripapillary retinal nerve fiber layer (RNFL). RNFL thickness was further evaluated along eight separate sectors (temporal lower, temporal upper, superior temporal, superior nasal, nasal upper, nasal lower, inferior nasal, and inferior temporal). Point-wise correlations were then computed between each of these OCT measures and the visual sensitivities at all VF locations assessed via Humphrey 10-2 and 24-2 perimetry. Lastly, OCT data were fit to VF data to predict glaucoma stage.

Results: The relationship between retinal thickness and visual sensitivities reflects the known topography of the retina. Spatial correlation patterns between visual sensitivities and RNFL thickness along different sectors broadly agree with previously hypothesized structure–function maps, yet suggest that structure–function maps still require more precise characterizations. Given these relationships, we find that OCT data can predict glaucoma stage.

Conclusion: Ganglion cell complex and RNFL thickness measurements are highlighted as the most promising candidate metrics for glaucoma detection and monitoring.

Answer to crossword 2

Across:

3. Buphthalmos ; 6.Topiramate; 9.Timolol;
10.Perimetry; 11. Aniridia;
13.Pseudoexfoliation; 14.Travoprost;
16.Betaxolol; 17.Brimodine

Down:

1.Microspherophekia; 2.Schlemms;
4.Pilocarpine; 5.Latanoprost;
7.Acetazolamide; 8.Bimatoprost;
12.Applanation; 15.Dorzolamide