# Automated Perimetry: *Basic Understanding*

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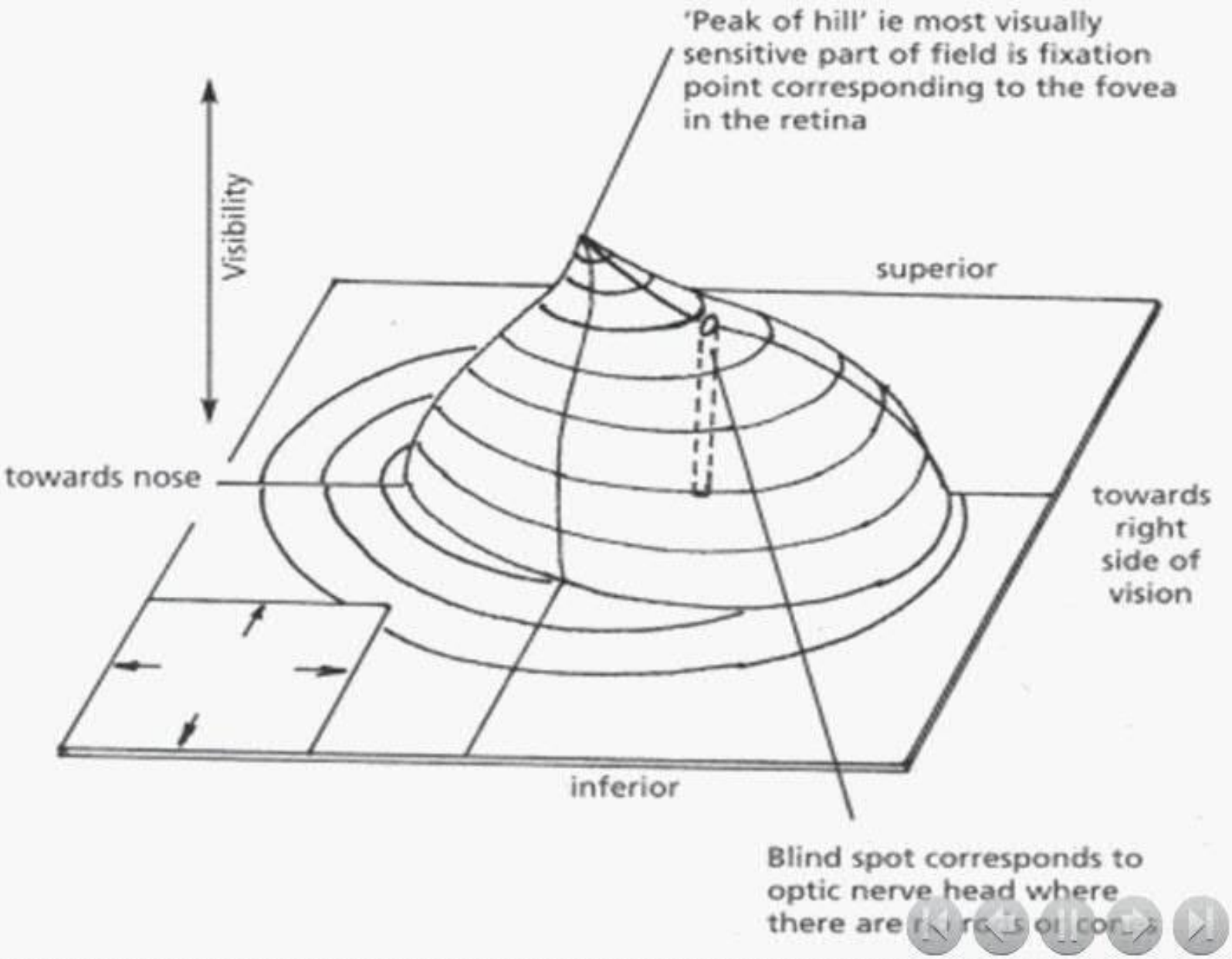
- ***The more we know , the more we know that there is more we have to know; The less we know, the less we know that there is more we have to know***

# Visual field

- A visual field can be represented as a three dimensional structure akin to a hill of increasing sensitivity
- Visual acuity is sharpest at the very top of the hill (i.e. the fovea) and then declines progressively towards the periphery, the nasal slope being steeper than the temporal.
- The ‘bottomless pit’ of the blind spot is located temporally between 10° and 20°, slightly below the horizontal.

# Hill of vision



# Normal visual field

- Oval in shape
- Temporally extends to 90-100* , superiorly & nasally 60* & inferiorly 70-75*
- Top of the island has highest sensitivity→ represents center of fixation *or* fovea.
- The bottomless pit → blind spot located 15* temporal to fovea

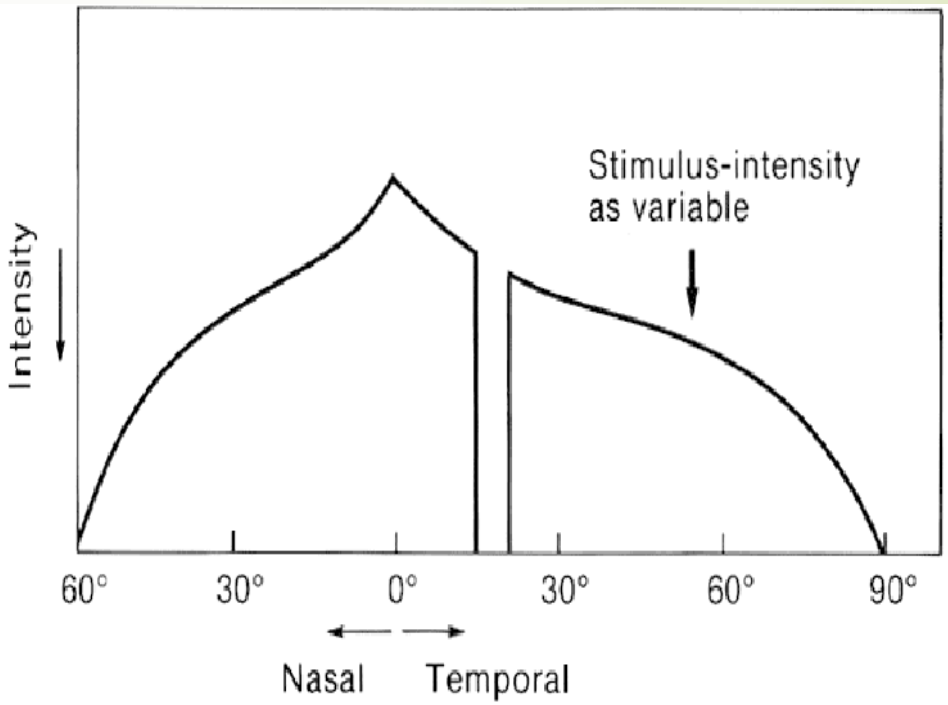



Fig. 5. In static perimetry, the intensity of a stationary target of constant size is varied to determine the sensitivity of specific locations in the field of vision.

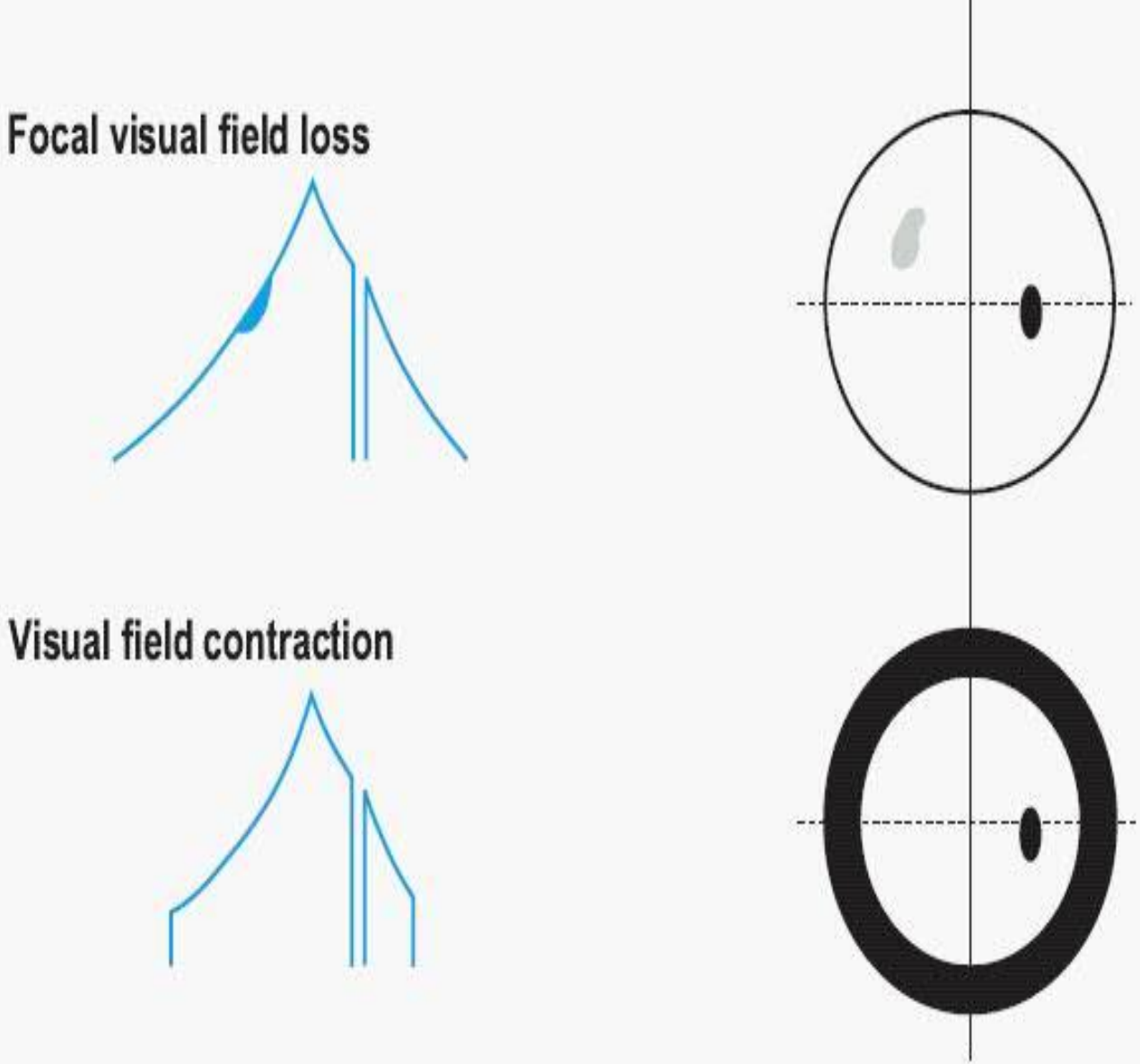
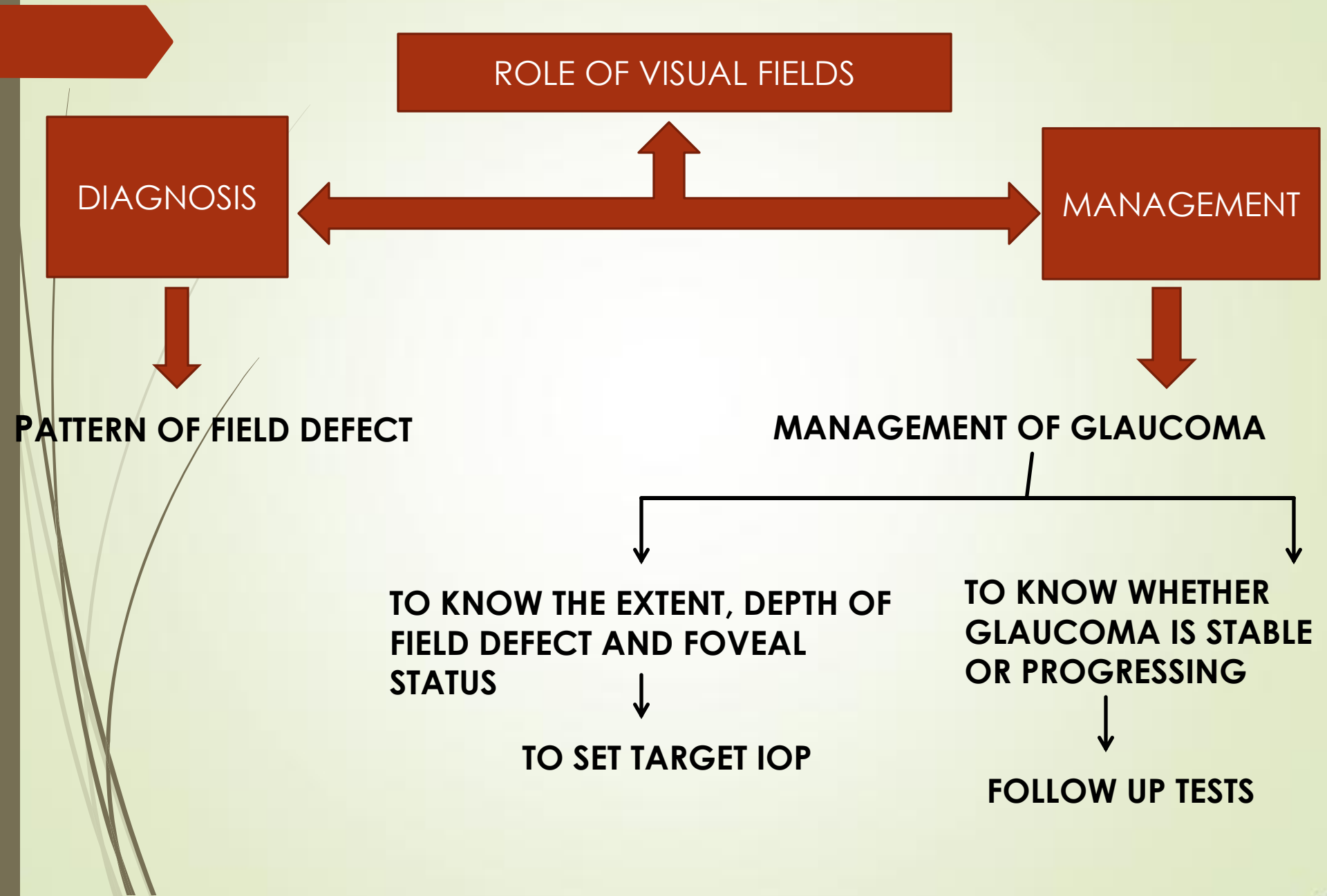



***Figure 1.1*** The hill of vision representation and the seen projection of the visual field (right eye)

# ROLE OF VISUAL FIELDS IN GLAUCOMA



# THE ROLE OF VISUAL FIELDS IN MAKING DIAGNOSIS

- The loss of retinal senstivity will present in 3 forms:there is a definite pattern of field defects

  A) localized

  B) uniform generalized

  C) irregular generalized.
- The localized pattern : nasal step,seidel scotoma etc
- Differentiation of field defect due to cataract
- The pattern of field defect due to optic nerve disorders: A) optic neuritis B) AION C) Papilloedema
- The pattern of field defects due to occipital lobe infarcts, tumour at optic chiasma.

# UNITS OF LIGHT INTENSITY AND RETINAL SENSTIVITY

Apostilbs(asb) unit and Decibel (dB) units.

10,000 asb units and this is the maximum intensity that Humphrey perimeter can project.

. Minimum intensity projected by Humphrey perimeter is 1 asb.

. We use generally db units in automated perimetry and convert it like this

1 db = 1/10 log attenuation of maximum stimulus

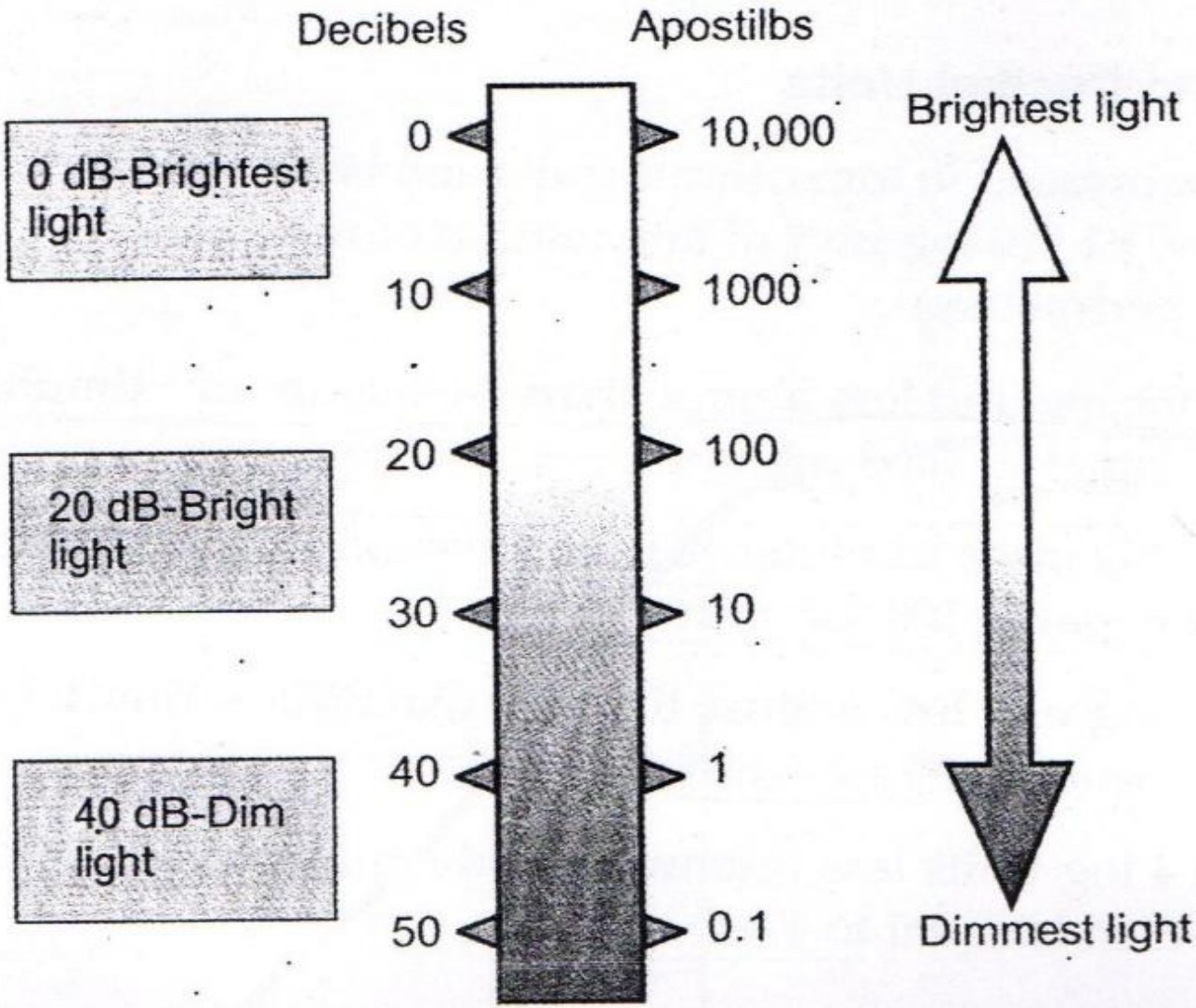
0 db = 10,000 asb(max)

10 db = 1000 asb

20 db = 100 asb

30 db = 10 asb

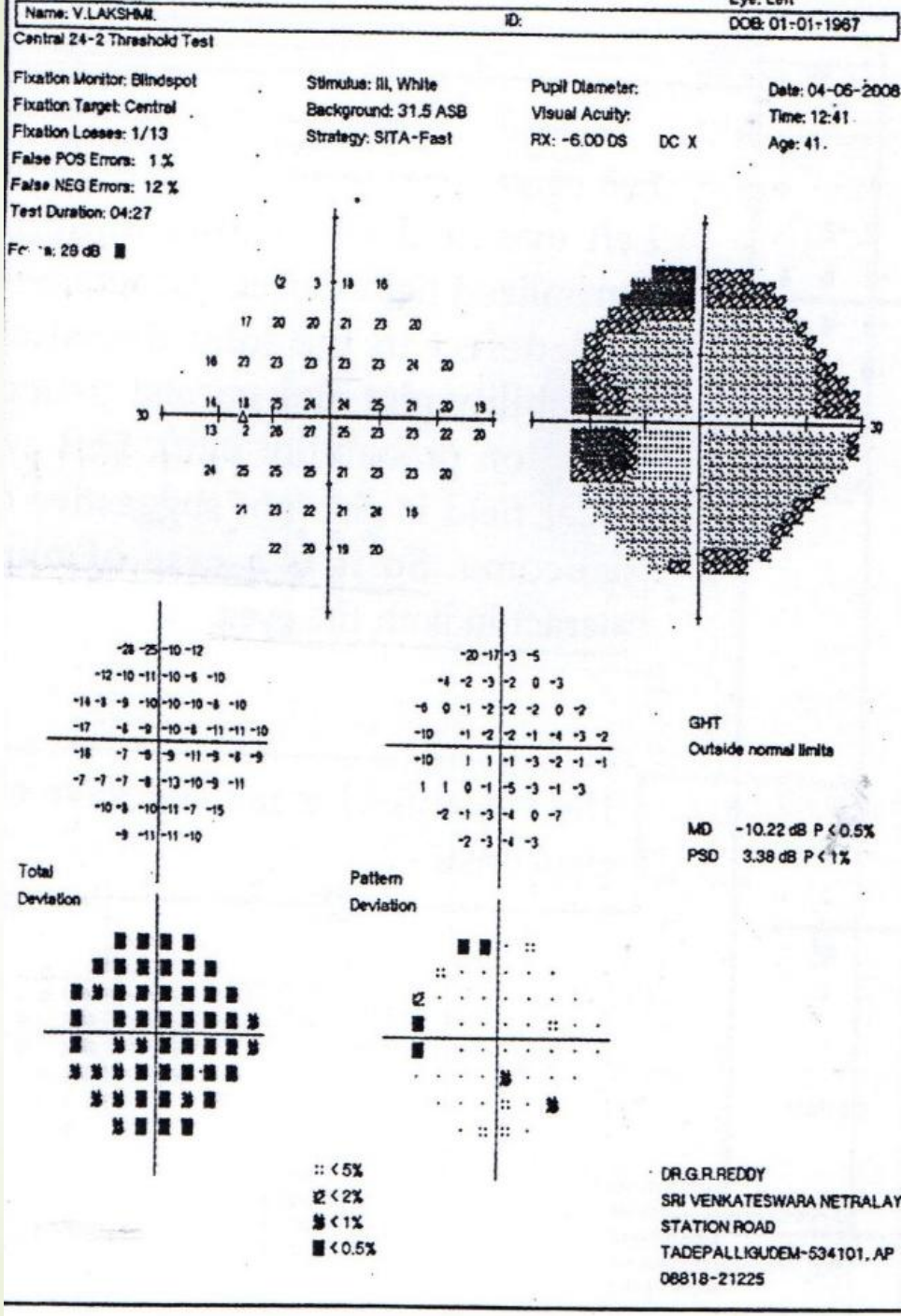
40 db = 1 asb




The decibel—apostilbs (asb) scale of Humphrey field analyzer

**As the db unit decreases,the light intensity increases**

- In Humphrey field analyzer when the maximum intensity of light 10,000 asb units is not perceived, it is labelled as 0 db retinal senstivity. Therefore 0 db indicates absolute scotoma.
- In Humphrey field analyzer when the minimum intensity of light 1 asb units is perceived,it is labeled as 40 db retinal senstivity. Therefore 40 db is the highest retinal senstivity point measured by Humphrey field analyzer.



- **Scotoma : It refers to an area of visual loss totally (absolute scotoma) or partially (relative scotoma) in the visual field.**

# Perimetry

- It is the procedure for estimating extent of the visual fields. It is classified as :

1. Kinetic perimetry
2. Static perimetry

# Kinetic perimetry

- In this the stimulus of known luminance is moved from a peripheral non-seeing point towards the centre till it is perceived to establish the isopters
- Various methods are:

1. Confrontation method
2. Lister's perimetry
3. Tangent screen scotometry
4. Goldman's manual perimetry

# Static perimetry

- This involves presenting a stimulus at a predetermined position for a preset duration with varying luminance in the field of vision
- Various methods are :

1. Goldman's manual perimetry
2. Friedmann perimetry
3. Automated perimetry

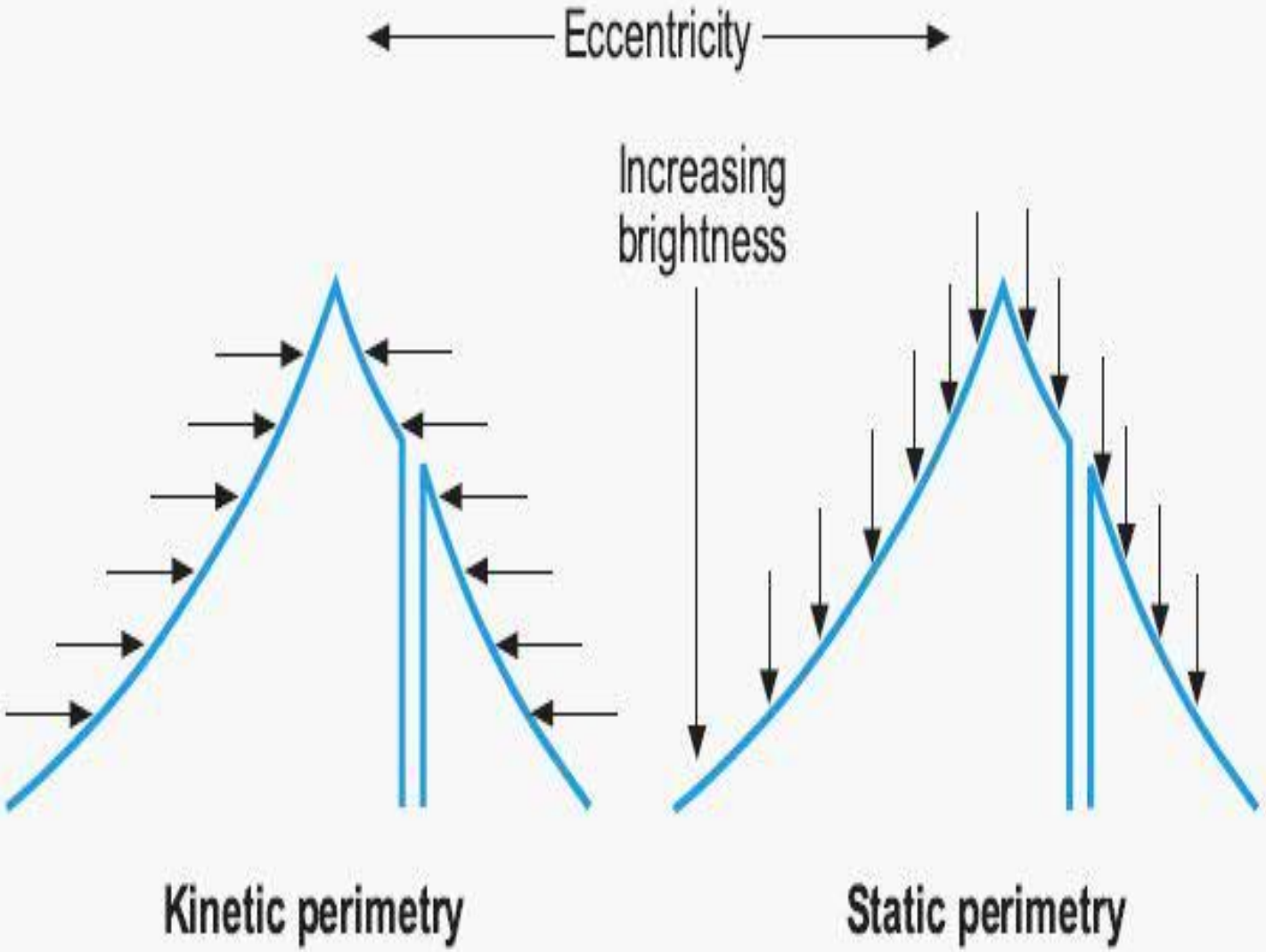



***Figure 3.1*** Kinetic and static perimetry

# Automated perimetry

- It is a computer assisted method and test visual fields by a static method
- Commonly used automated perimeters are:

1. Octopus field master
2. Humphrey field analyser

# Automated perimeter

# Automated perimeter variables

1. Background illumination : HFA uses 31.5 apostilb (asb) background illumination

   Apostilb(asb) is a unit of brightness per unit area

2. Stimulus intensity : HFA uses projected stimuli which can be varied in intensity over a range of between 0.08 and 10,000 asb

   In decibel notation(db), the value refers to retinal sensitivity rather than to stimulus intensity

3. Stimulus size : HFA usually offers five sizes of stimuli

The standard target size for automated perimetry is equivalent to Goldmann size III (4 mm sq) white target

4. Stimulus duration : HFA uses a stimulus duration of 0.2 sec

# Testing strategies..

- Two basic strategies are used in automated static perimetry:

1. Suprathreshold testing
2. Threshold testing

- Threshold at a given location in the visual field is the brightness of a stimulus at which it can be detected by the subject.
- It is defined as ‘the luminance of a given fixed-location stimulus at which it is seen on 50% of the occasions it is presented’
- provides more precise results than suprathreshold testing and thus preferred

# SUPRATHRESHOLD PERIMETRY

- Stimuli of luminance above the expected normal threshold levels for age matched population
- It enables testing to be carried out rapidly to indicate whether function is grossly normal or not
- it is not highly quantitative, and so is usually reserved for screening
- Detects gross defects

# Humphrey Automated Visual Field Tests

- Threshold Tests
  - Central Tests
    - Central 30-2
    - Central 24-2
    - Central 10-2
    - Macular progm.
  - Peripheral Tests
    - Peripheral 60-4
    - Nasal step
    - Temporal crescent
  - Specialty Tests
    - Neurological 20
    - Neurological 30
- Screening Tests*

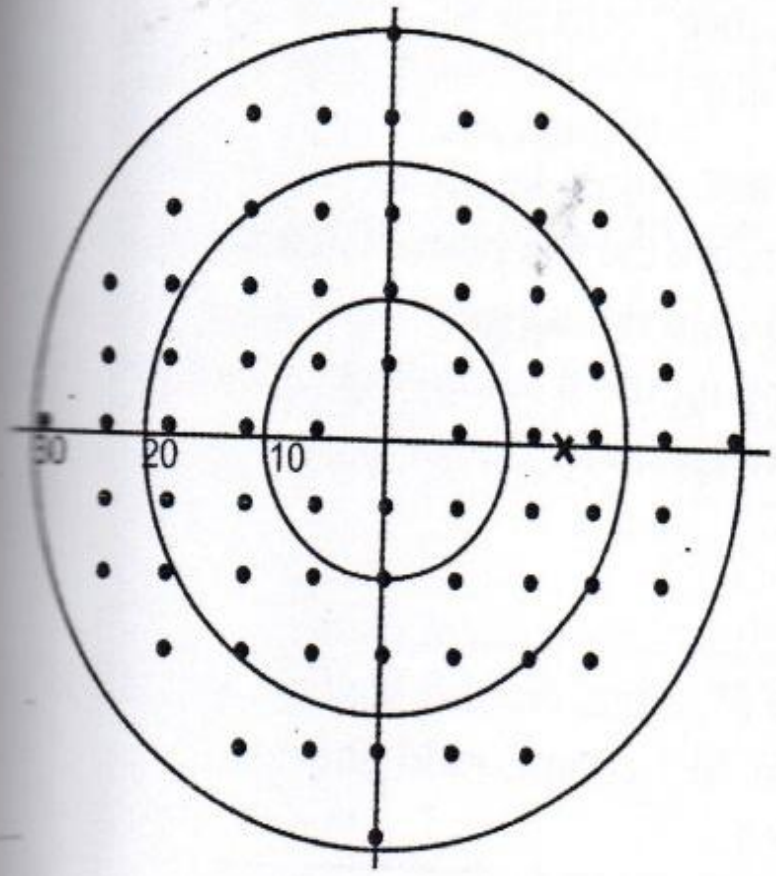
*Discussed on the next slide

# Test programmes

- Central field tests are commonly employed.These include:

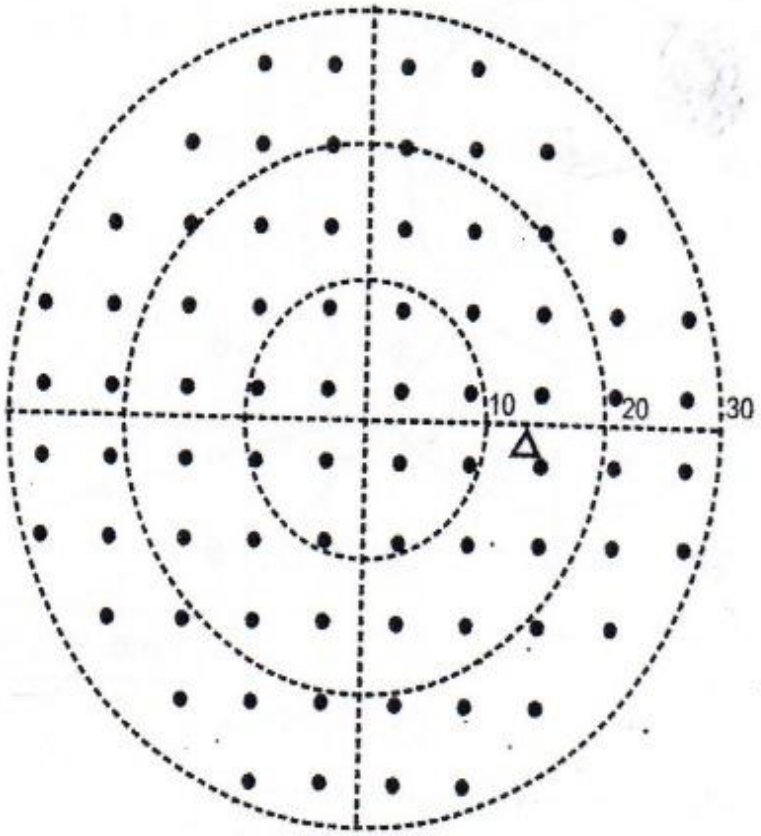
1. Central 30-2 test:

- It offers visual field assessment of central 30 degrees.
- It consists of 76 points 6 degrees apart on either side of the vertical and horizontal axes, such that the innermost points are three degrees from the fixation point




30-1 Central field

Note the points on **the horizontal and vertical axes in 30-1.**




30-2 Central field

No points on **the horizontal and vertical axes in 30-2.**

- The central 30-2 consists of a 76-point grid,each point 6 degree apart,deliberately straddling both horizontal and vertical axes so that 4 innermost test points are 3 degree from fixation spot.

- This contrast with central 30-1 ,whose 71 point rectilinear grid actually falls on horizontal and vertical axes.This spacing however leaves 6 degree bare area of test point surrounding the fixation spot.

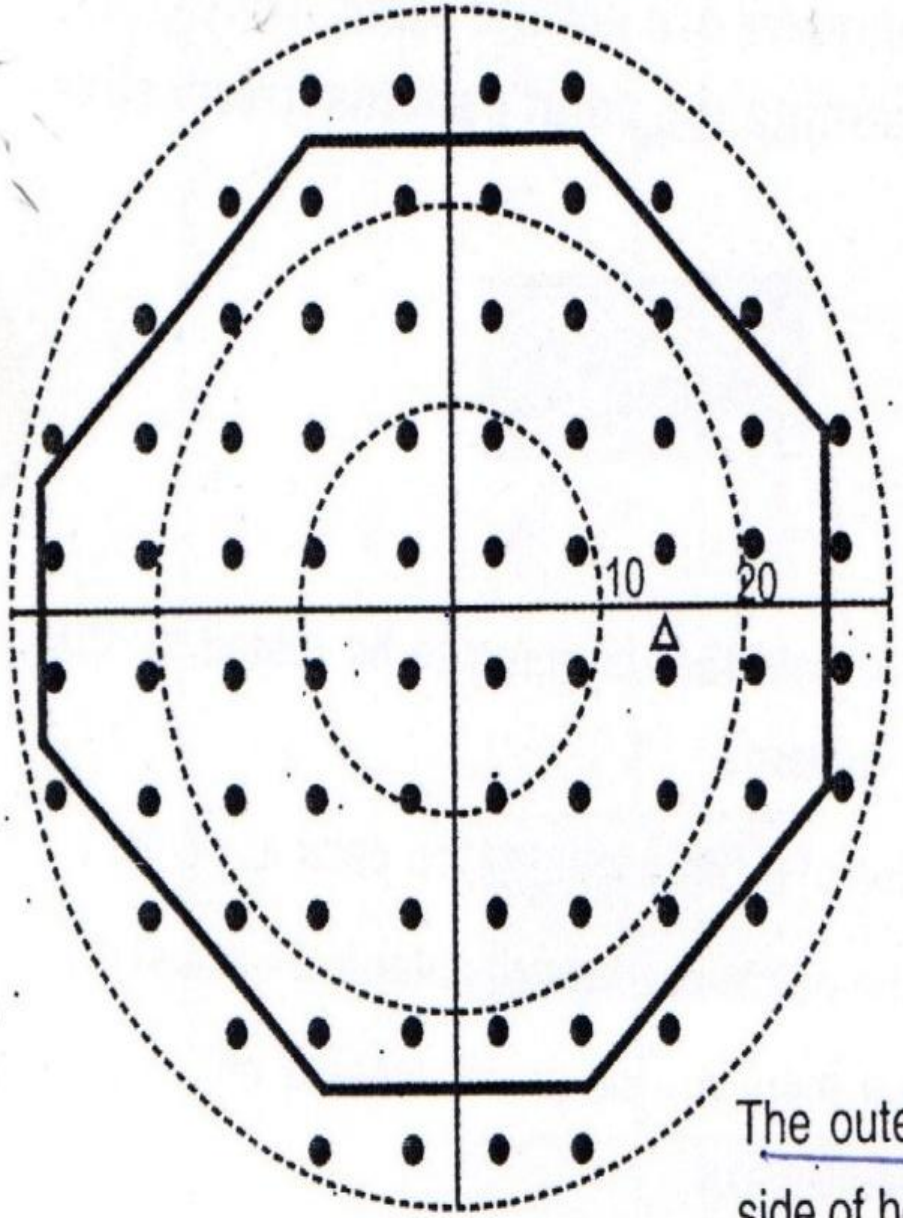
- Because of its greater number of points and their greater proximity to fixation,the central 30-2 is commonly preferred as primary testing pattern.

# Central field tests

2. Central 24-2 test:

- In it, 54 points are examined.
- It is near similar to the 30-2 test except that the two peripheral nasal points at 30 degrees on either side of the horizontal axis are not included while testing the central 24 degrees

## The 30-2 point pattern

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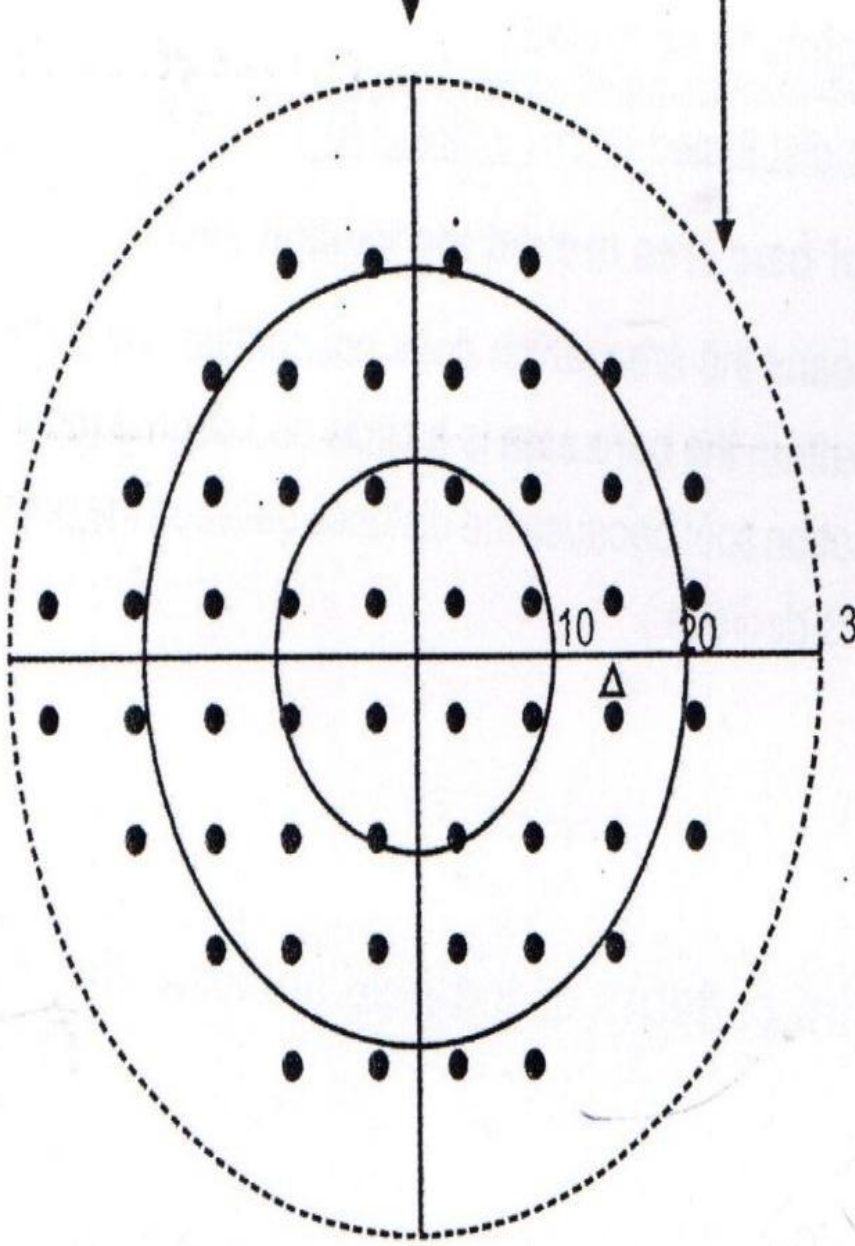


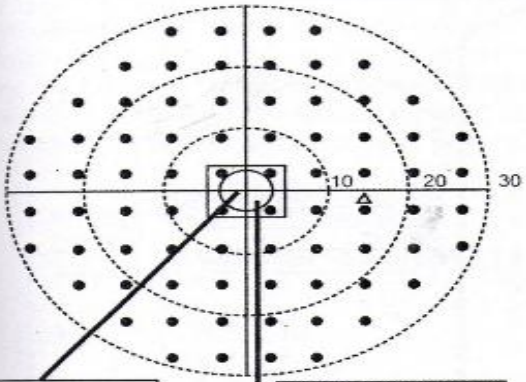

## 24-2 Point pattern:

# Central field tests..

3. Central 10-2 test:

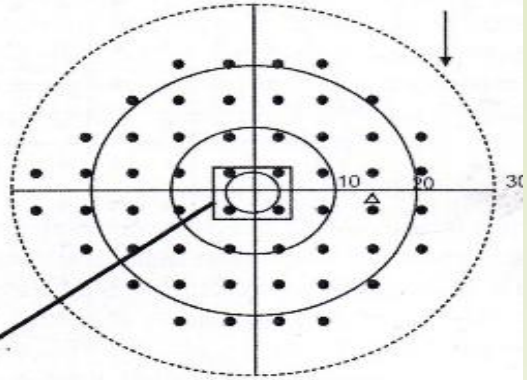
- When most points in the arcuate region  between 10 and 30 degrees show marked depression then this test helps to assess and follow up 68 points 2 degrees apart in the central 10 degree are examined

## Understanding of the concept of bare areas in 30-2, 24-2, and 10-2 point patterns



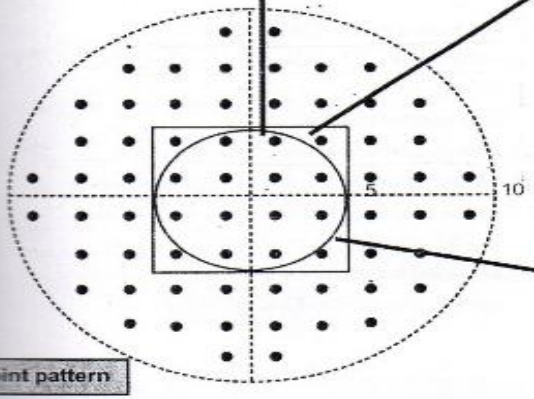

in 30-2 and 24-2 ttern

**30-2 Point pattern**



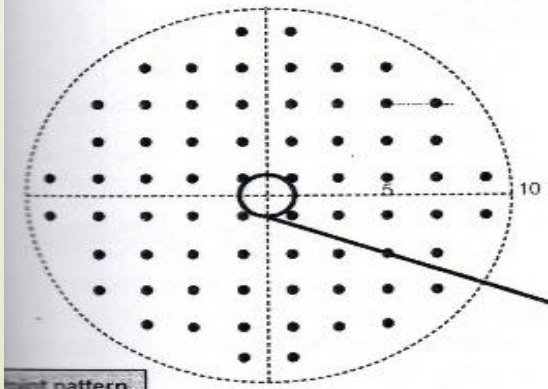

**24-2 Point pattern**

An area of 3° radius of a circle around fixation point is devoid of any test points in 30-2 and 24-2 point patterns and hence is not tested. This area of 3° radius of a circle which is not tested is called as bare area.




oint pattern

The area of 3° radius of a circle around fixation point contains 12 points in 10-2 point pattern. So the bare area of 30-2 or 24-2 contains 12 points in 10-2 point pattern




oint pattern

In 10-2 point pattern there is only an area of 1° radius of a circle around fixation spot is devoid of test points. In 10-2 most of the central area around fixation point is being tested and hence became the point pattern of choice in advanced cases of glaucoma to know the macular status.

1° radius of a circle is the bare area in 10-2 point pattern

# Central field tests..

4. Macular grid tests:

- It is used when the field is limited to central 5 degrees
- This test examines 10 points spaced on a 29 degree square grid centred on the point of fixation

# Setting up the patient

- The patient must be set up comfortably and correctly aligned with the perimeter, in order that the visual examination is carried out efficiently

- An occluding eye patch must be must be placed over the eye not being examined

- Patient must be asked to place their chin and head on chin and head rest respectively. Both rest must be clean and sterile

- If the visual field examination is to be carried out using the patient's own spectacles, consideration should be given to the size of lens aperture, as the rims of the frame could cause formation of an artifact peripheral scotoma

Single Field Analysis

| Name: KAMLESH TANDAN | ID: 473909 | Eye: Left |
|---|---|---|
| Central 24-2 Threshold Test | | DOB: 07-09-1948 |

Fixation Monitor: Gaze/Blindspot
Fixation Target: Central
Fixation Losses: 5/18
False POS Errors: 7 %
False NEG Errors: 0 %
Test Duration: 08:43

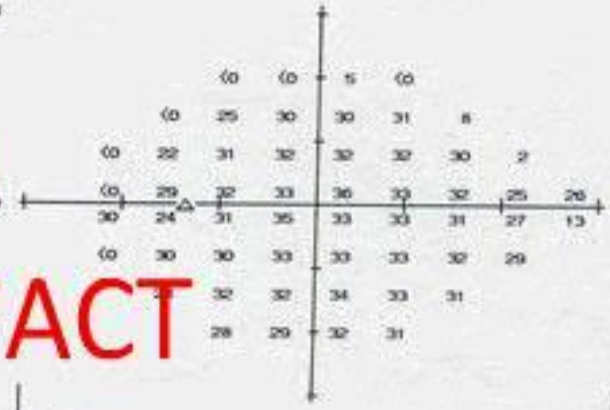
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard

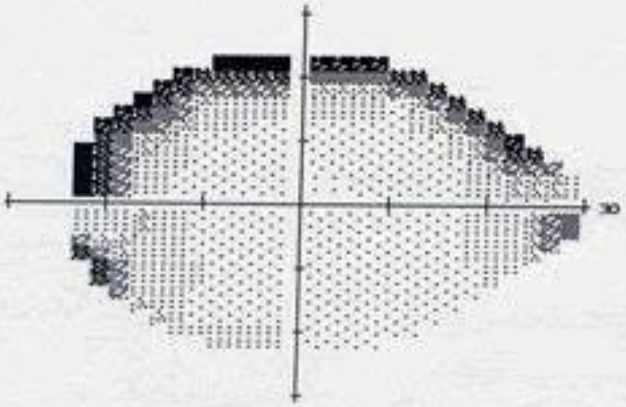
Pupil Diameter: 5.1 mm
Visual Acuity: 6/9
RX: +7.75 DS -1.25 DC X 90

Date: 29-11-2000
Time: 8:32 AM
Age: 52

Fovea: 40 dB

RIM ARTIFACT



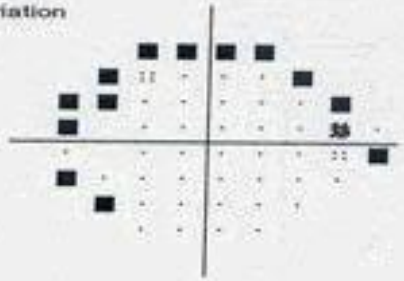


GHT
Outside normal limits

MD -3.67 dB P < 1%
PSD 10.39 dB P < 0.5%

Total Deviation

Pattern Deviation



:: < 5%
< 2%
< 1%
■ < 0.5%

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HFA II 750-2030-A10.1

- In elderly patients, superior lid ptosis may be present. Visual field examination in such patients can yield a superior visual field defect, due to eye lid position encroaching over the pupil

- Any refractive corrective lenses should be incorporated into perimeter before the patient is presented to the chin and head rest

- The patient should be instructed to view the fixation target and not to look away from it at any point during the test

- They should be told that periodically a light will appear somewhere in the edge of their vision.If they think they see a light they must press the response button

Zone 1
Patient data / test data

Zone 2
Reliability data

Zone 3
Raw data

The present retinal sensitivity at the selected points

Zone 4
Raw data

The present retinal sensitivity at shown in shades

Zone 7
Pattern deviation numerical plot

Zone 5 total deviation numerical plot

Loss of sensitivity plot depth of the field defect

Zone 10
Glaucoma hemifield test

General height of the hill of vision is adjusted to bring out the pattern of the field defect in generalized depression

Zone 9
Global indices-

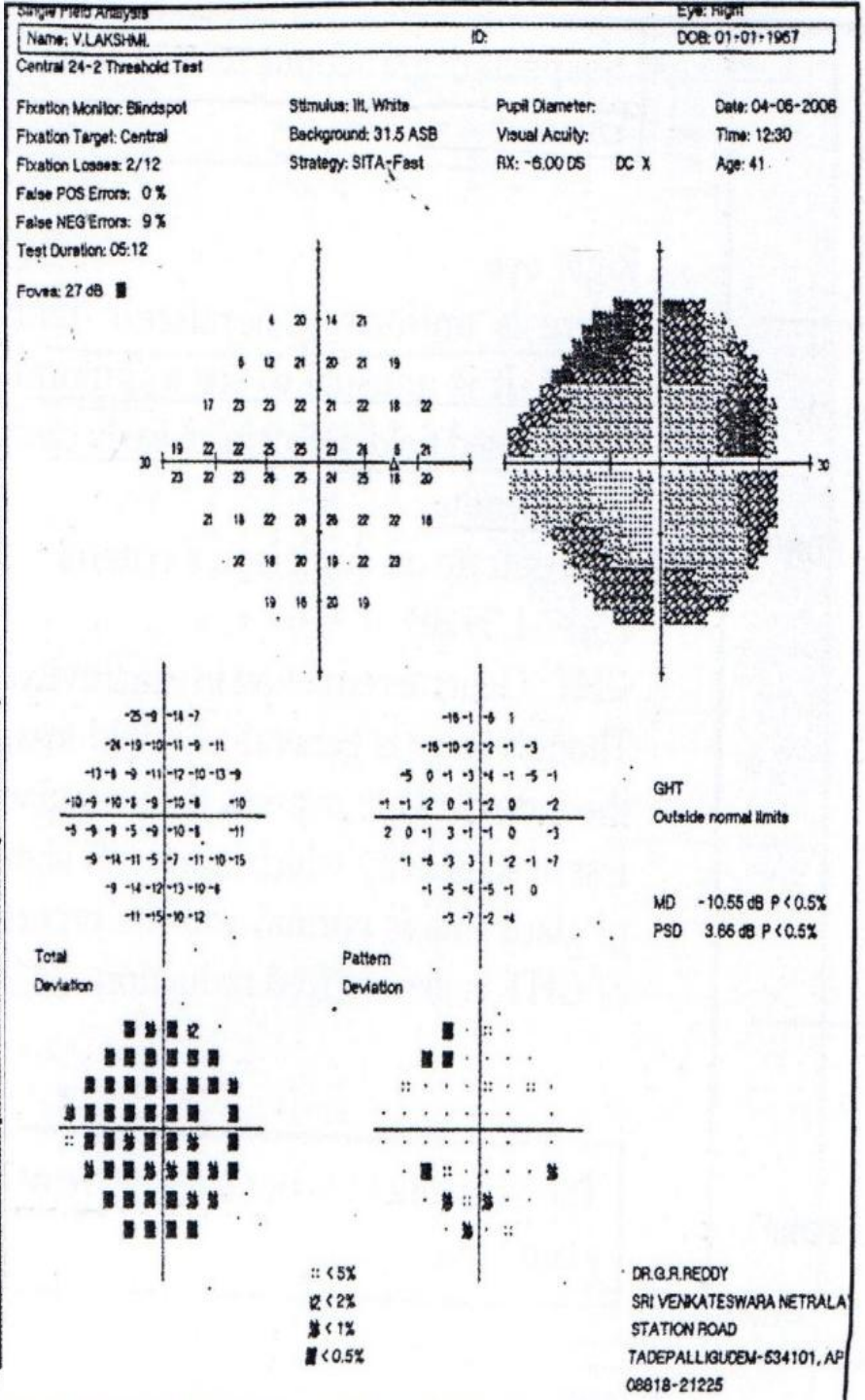
MD index
PSD
SF
CPSD

Zone 6 total deviation numerical plot

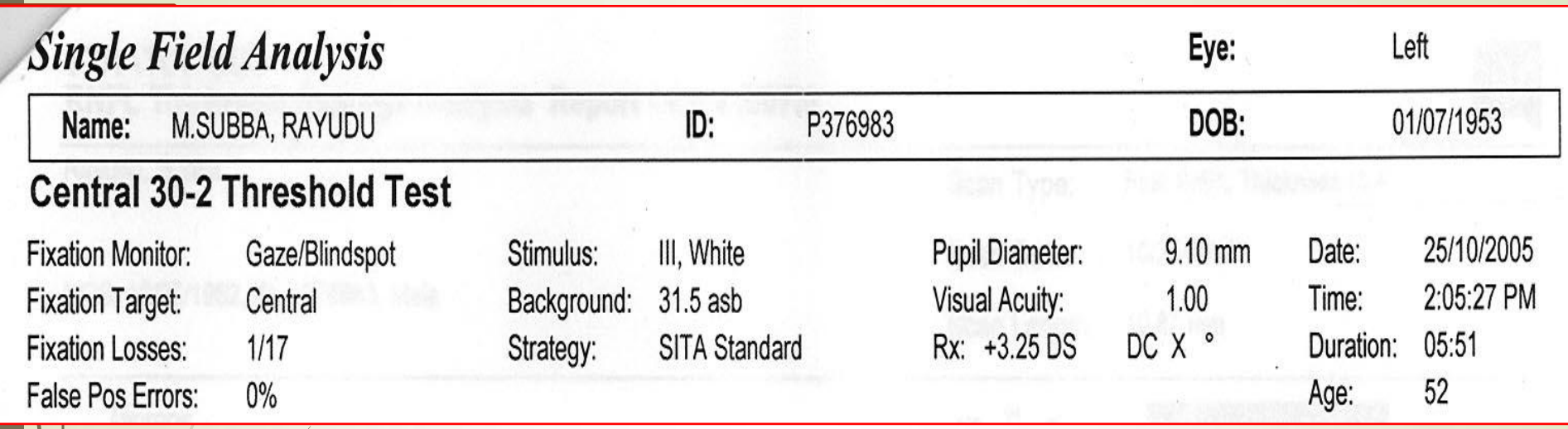
Pattern and extent of the field defect expressed in terms of P value

Zone 8 pattern deviation probability

The pattern of the field defect in generalized depression



# Zone 1



*Single Field Analysis* **Eye:** Left

| **Name:** | M.SUBBA, RAYUDU | **ID:** | P376983 | **DOB:** | 01/07/1953 |
|---|---|---|---|---|---|

**Central 30-2 Threshold Test**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Fixation Monitor: | Gaze/Blindspot | Stimulus: | III, White | Pupil Diameter: | 9.10 mm | Date: | 25/10/2005 |
| Fixation Target: | Central | Background: | 31.5 asb | Visual Acuity: | 1.00 | Time: | 2:05:27 PM |
| Fixation Losses: | 1/17 | Strategy: | SITA Standard | Rx: +3.25 DS | DC X ° | Duration: | 05:51 |
| False Pos Errors: | 0% | | | | | Age: | 52 |

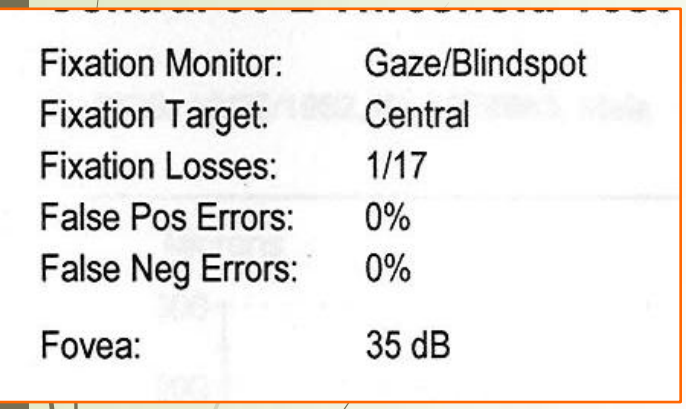
***Pt. name & ID :*** *For subsequent follow up*

***Age:*** *Pt's response is compared with age matched controls*

***Test program/strategy :***

***VA ; Pupil diameter; refractive error correction :*** *all affect the final outcome of the result.*

# Zone 2( Reliability Indices)



| | |
|---|---|
| Fixation Monitor: | Gaze/Blindspot |
| Fixation Target: | Central |
| Fixation Losses: | 1/17 |
| False Pos Errors: | 0% |
| False Neg Errors: | 0% |
| Fovea: | 35 dB |

- **Fixation loss :**
  - **Ratio of the no of time the pt responded when he saw a target in a blind spot against total no of time fixation was tested.**
  - **When fixation loss is >20% it is bracketed (xx) & indicate questionable reliability.**

**In suspected cases of glaucoma the fixation losses,false positive and false negative errors should be absolutely 0%. In other words performance of the test should be 100% perfect. In established and advanced cases of glaucoma the indices can be considered reliable upto 20%. If the reliability indices cross 33% then the test becomes reliable**

# Zone 2

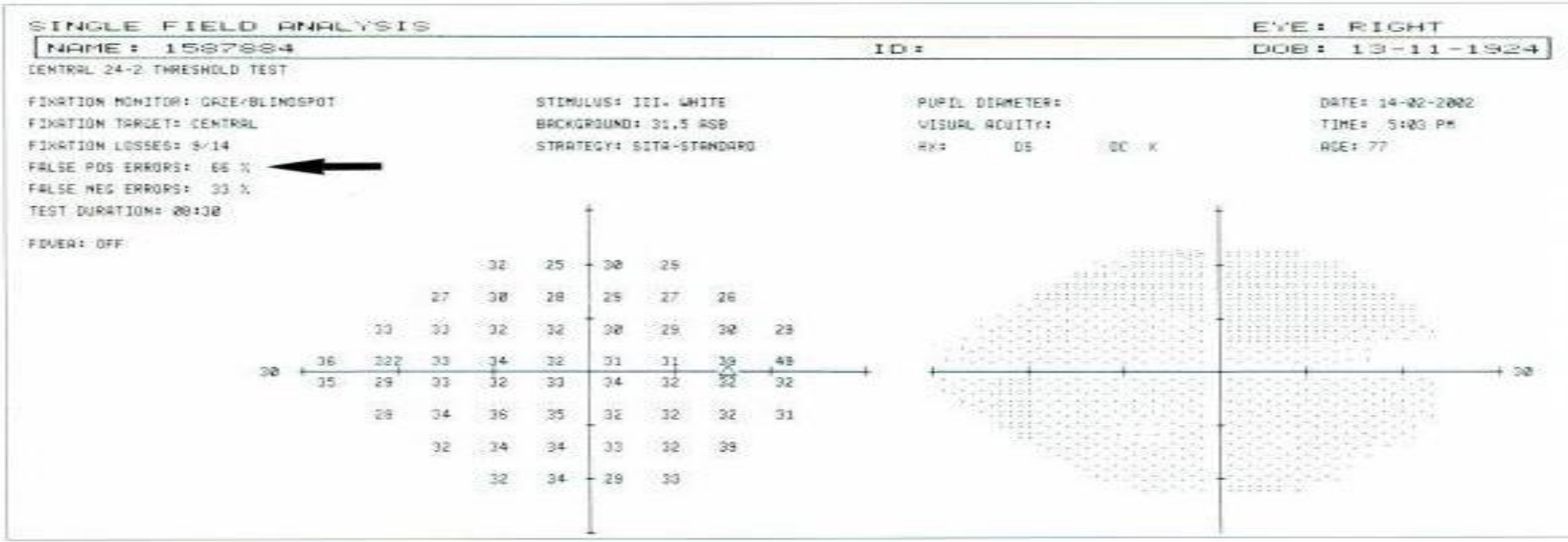
- FALSE POSITIVE ERRORS
- Detected when stimulus is accompanied by sound
- Patient presses response button even when no stimulus is seen
- FP rates >20 % indicate compromised results (trigger happy patient)
- False Negatives:
  - When a stimulus of supra threshold intensity presented in previously measured point & pt failed to respond it it is a FN error.
  - Expressed as a ratio
  - > 33% is bracketed

*Remember*

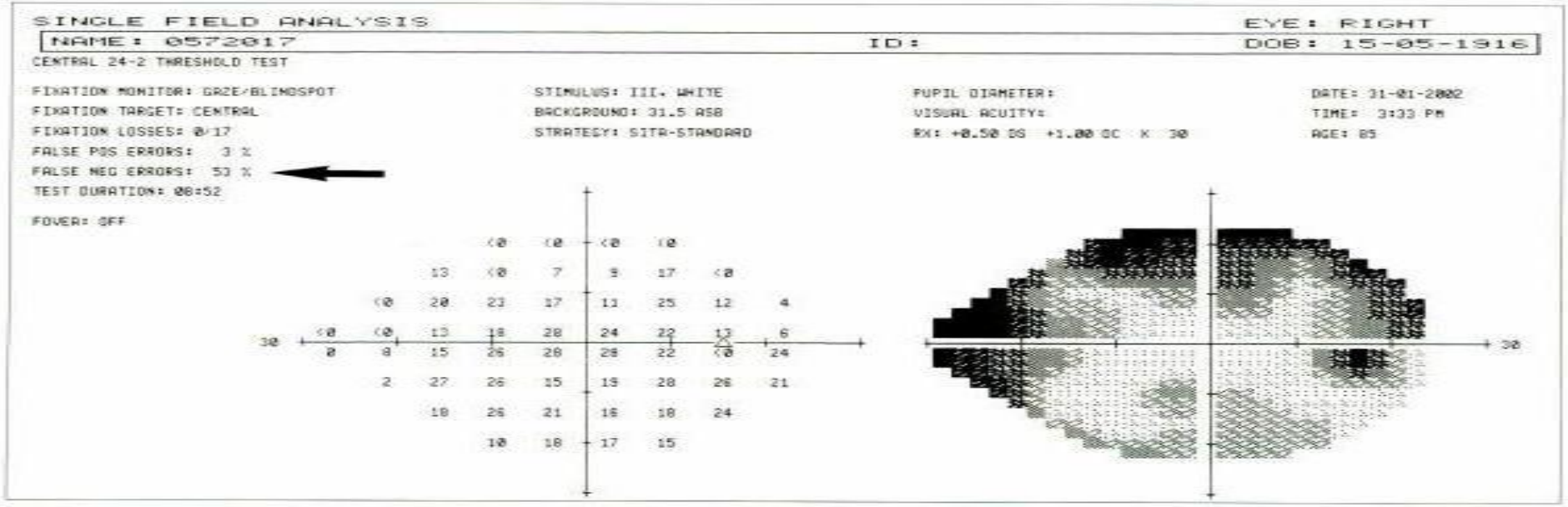
- *Damage area of the field demonstrate more variability than normal.*

Foveal threshold:

- Should be over 30d B for a VA 6/12 or better
- Normal FT with poorly recorded VA indicate refractive error or mild amblyopia.




. 1.46
h false-positive score (arrow) with an abnormally pale grey-scale display

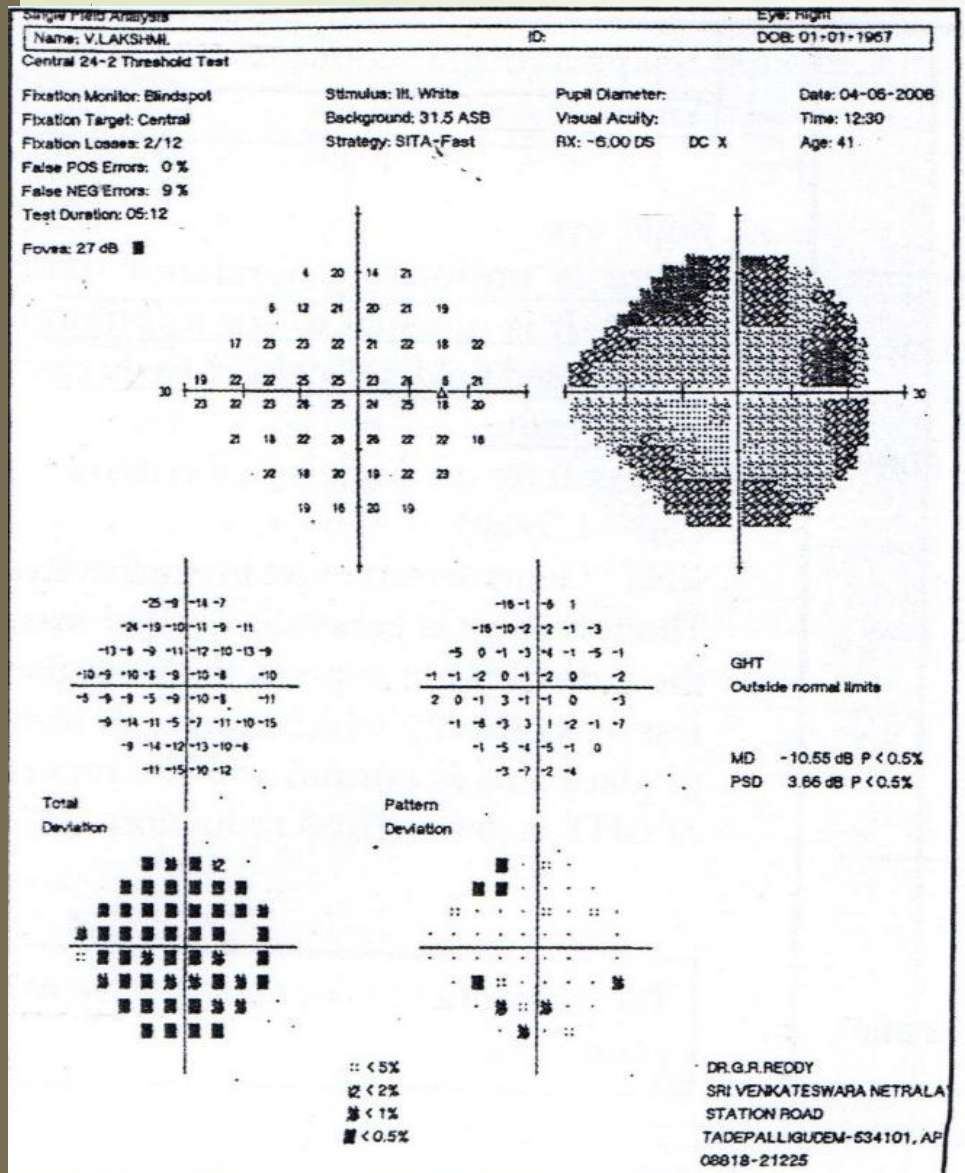



7
se-negative score (arrow) with a clover leaf-shaped grey-scale display

- Fixation losses: During the test itself 5% of stimuli will be presented on the blind spot. The patient's response to this stimulus presentation is due to shift of fixation.

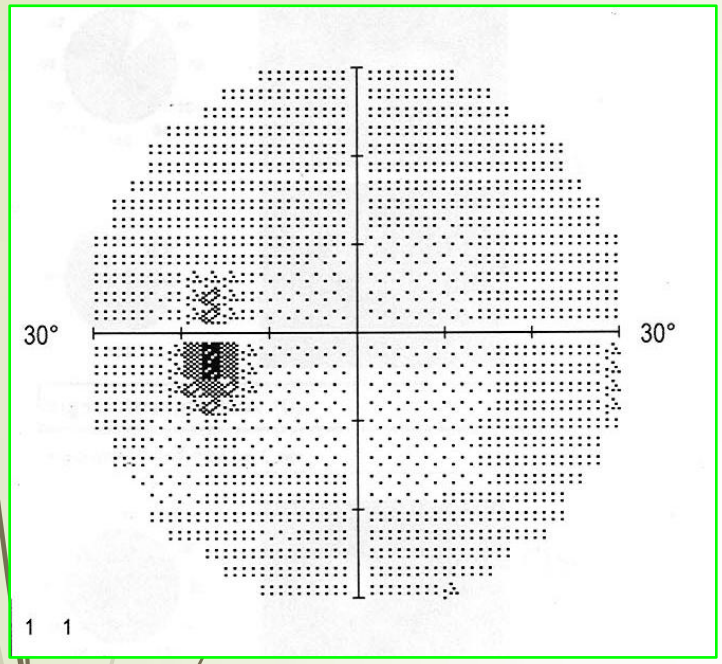
- Always try to get false positives ,false negatives and fixation losses to zero,zero and zero respectively in suspicious case of glaucoma. In established and advanced cases of glaucoma upto 20% of false positives,false negatives and fixation losses are considered to be acceptable.

# Zone 3 (Raw / Numeric data)

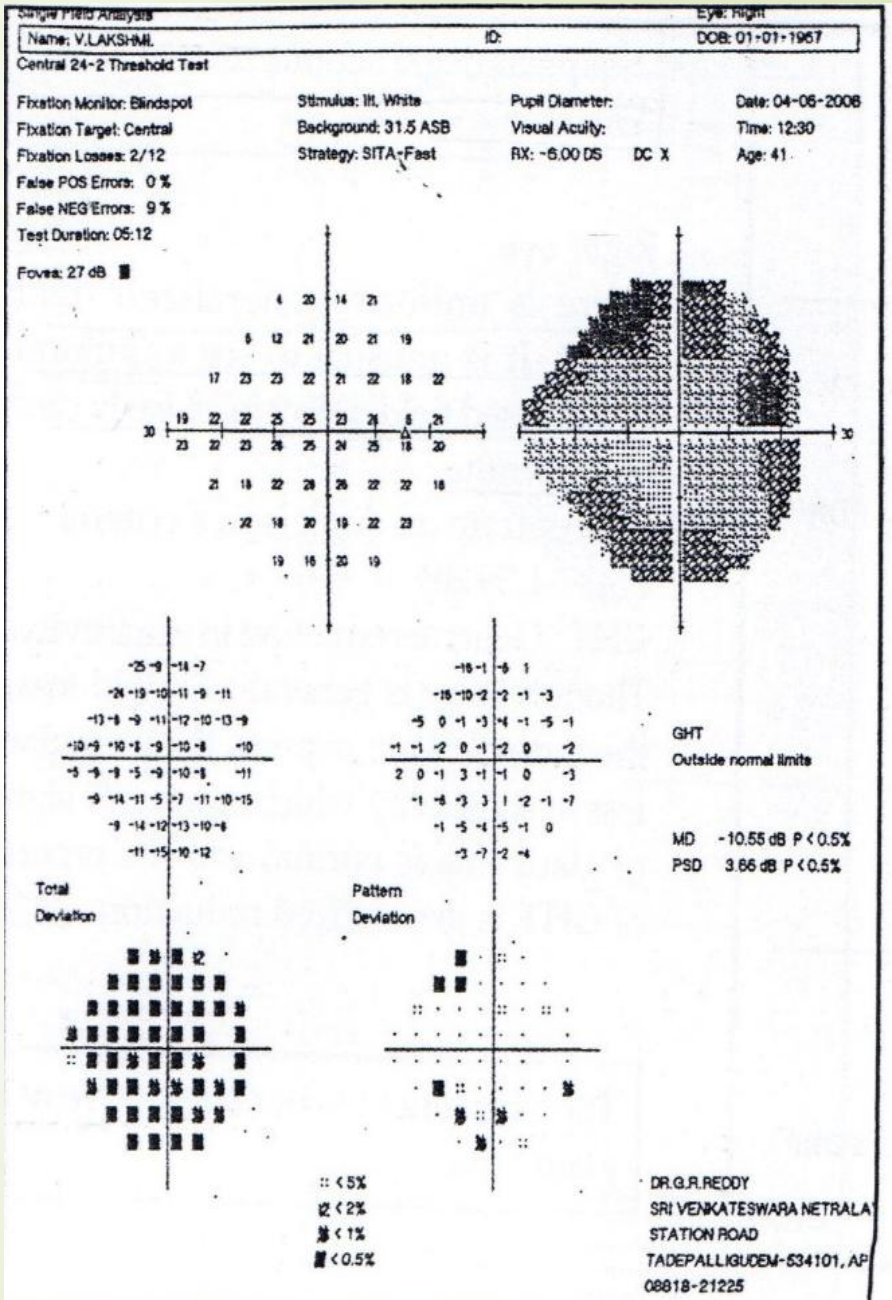



- Actual threshold score for each threshold points
- 0 indicates absolute scotoma

# Zone 4 ( Grey Scale)




- Rough indicator of depth and also extent of field damage.
- But may be misleading because various artifacts influence this scale



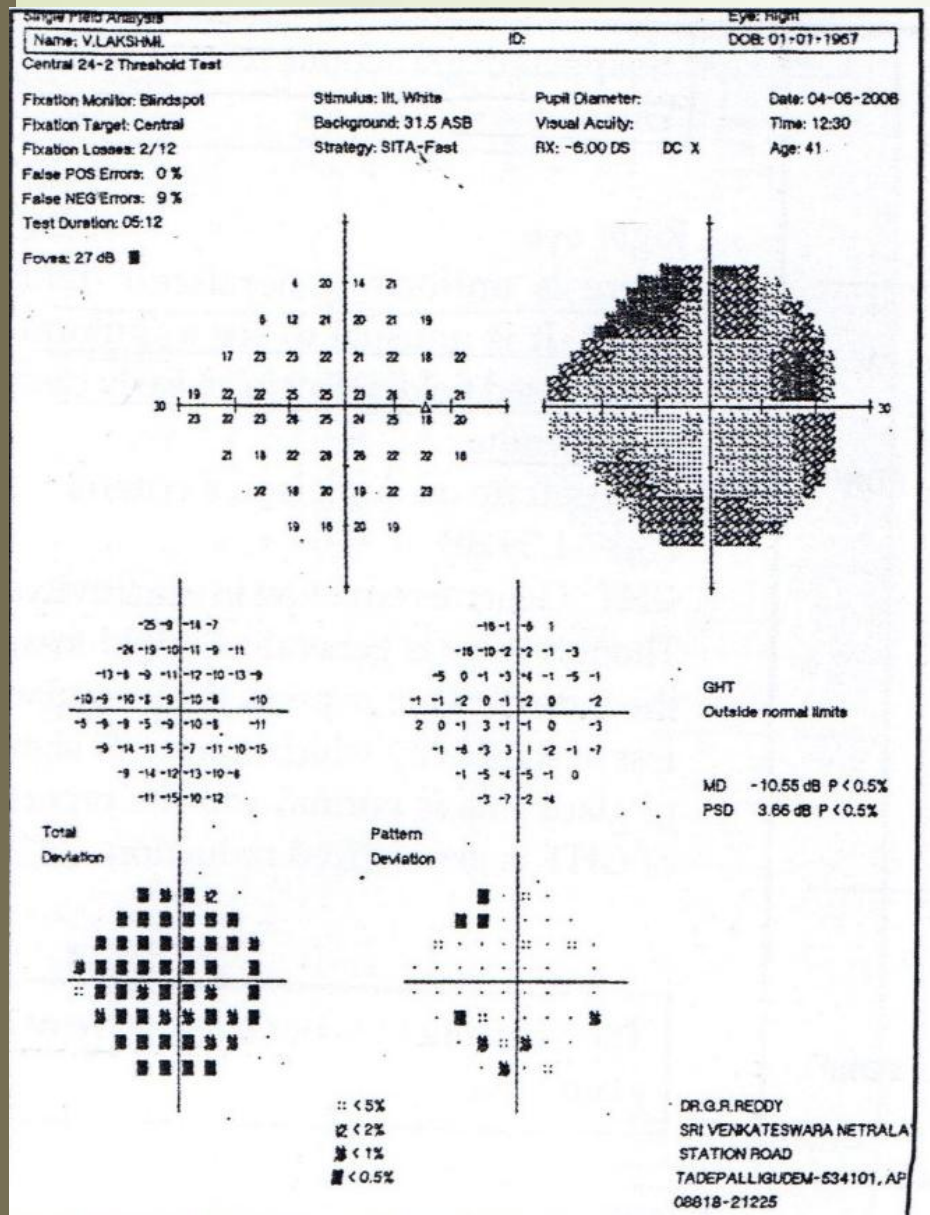
# Zone 4 Grey Scale

- Retinal sensitivity values from the best retinal sensitivity value (50db) to absolute scotoma 0(db) are divided into 10 groups. Each step of pattern corresponds to a change of 5 db intensity,except the first column represented by 50 dB to 41 dB.
- Areas of high sensitivity are denoted by lighter shades and areas of low sensitivity are denoted by darker.

*Table 7.3 The Grayscale Shades Found on HFA II-i Printouts and Their Numerical Equivalents in Apostilbs (ASB) and Decibels (dB).*

| SYM | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ASB | .8 – .1 | 2.5 – 1 | 8 – 3.2 | 25 – 10 | 79 – 32 | 251 – 100 | 794 – 316 | 2512 – 1000 | 7943 – 3162 | ≥ 10000 |
| DB | 41 – 50 | 36 – 40 | 31 – 35 | 26 – 30 | 21 – 25 | 16 – 20 | 11 – 15 | 6 – 10 | 1 – 5 | ≤0 |

# Zone 5 ( Total Deviation Plot)



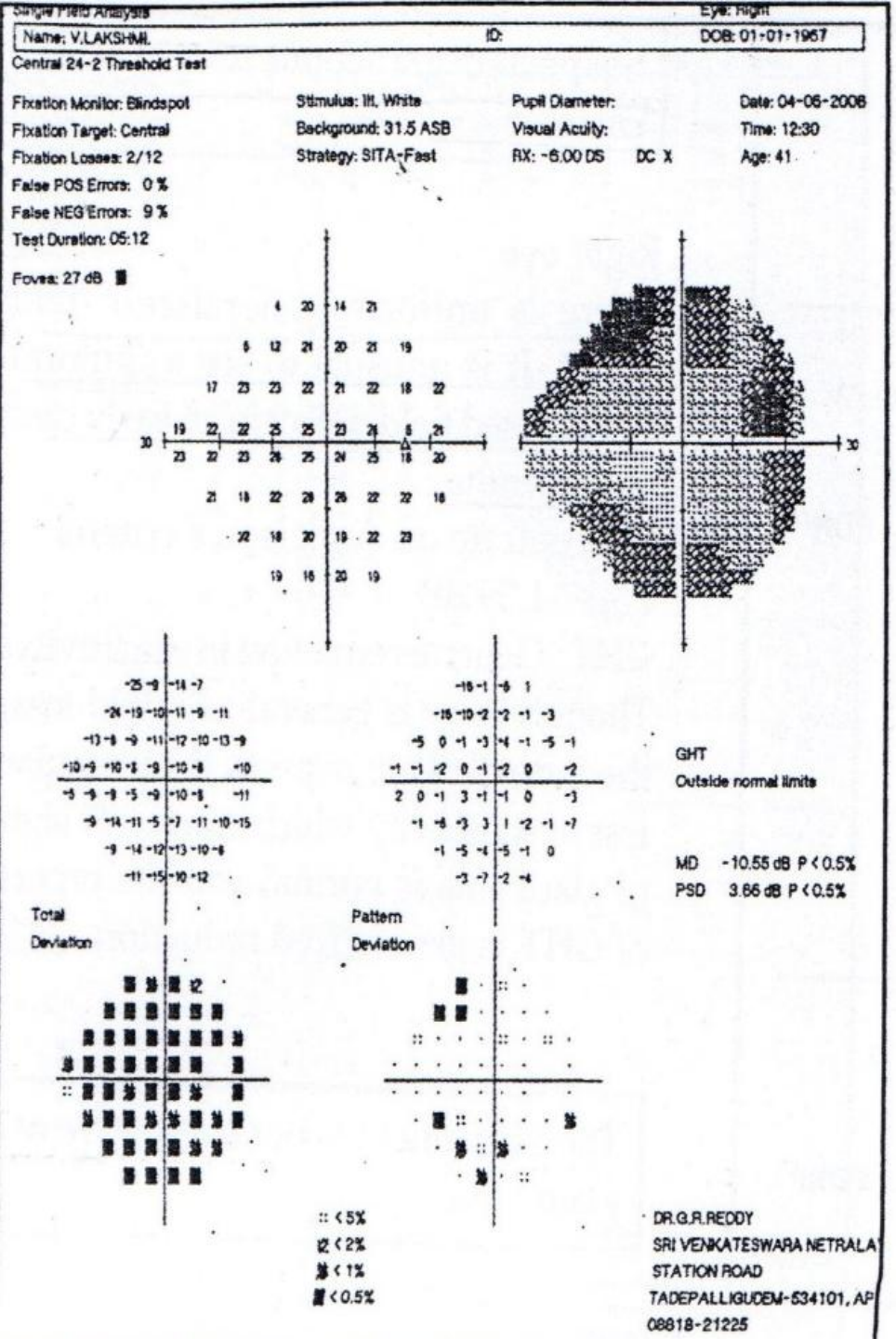

- Created by substracting the actual raw data from the expected value of aged matched control in each point.
- Is expressed as “+” or “-” ve depending upon the data is better or worse than expected.

# Total deviation plots

- It provides the deviation of patient's threshold values from that of age corrected normal data
- These are of two types:

1. *Numeric deviation plot* represents the differences in decibels

- A zero value means that patient has expected threshold for that age
- Positive numbers reflect points that are more sensitive than average for that age
- Negative numbers reflect points that are depressed compared with the average




- 2.Total deviation *Probability plot (grey scale symbol plot)*
- The darker the graphic representation, the more significant it is.
- In general, the total deviation plot is an indicator of general depression and is not capable of revealing hidden scotomas that may be present in overall depressed field

:: P < 5%

P < 2%

P < 1%

■ P < 0.5%

## P value

P < 5% indicates that this degree of loss sensitivity of that point is seen in < 5% of normal population. The P< 5% is represented by - :: < 5%

P < 2% indicates that this degree of loss sensitivity of that point is seen in < 2% of normal population. The P< 2% is represented by- < 2%

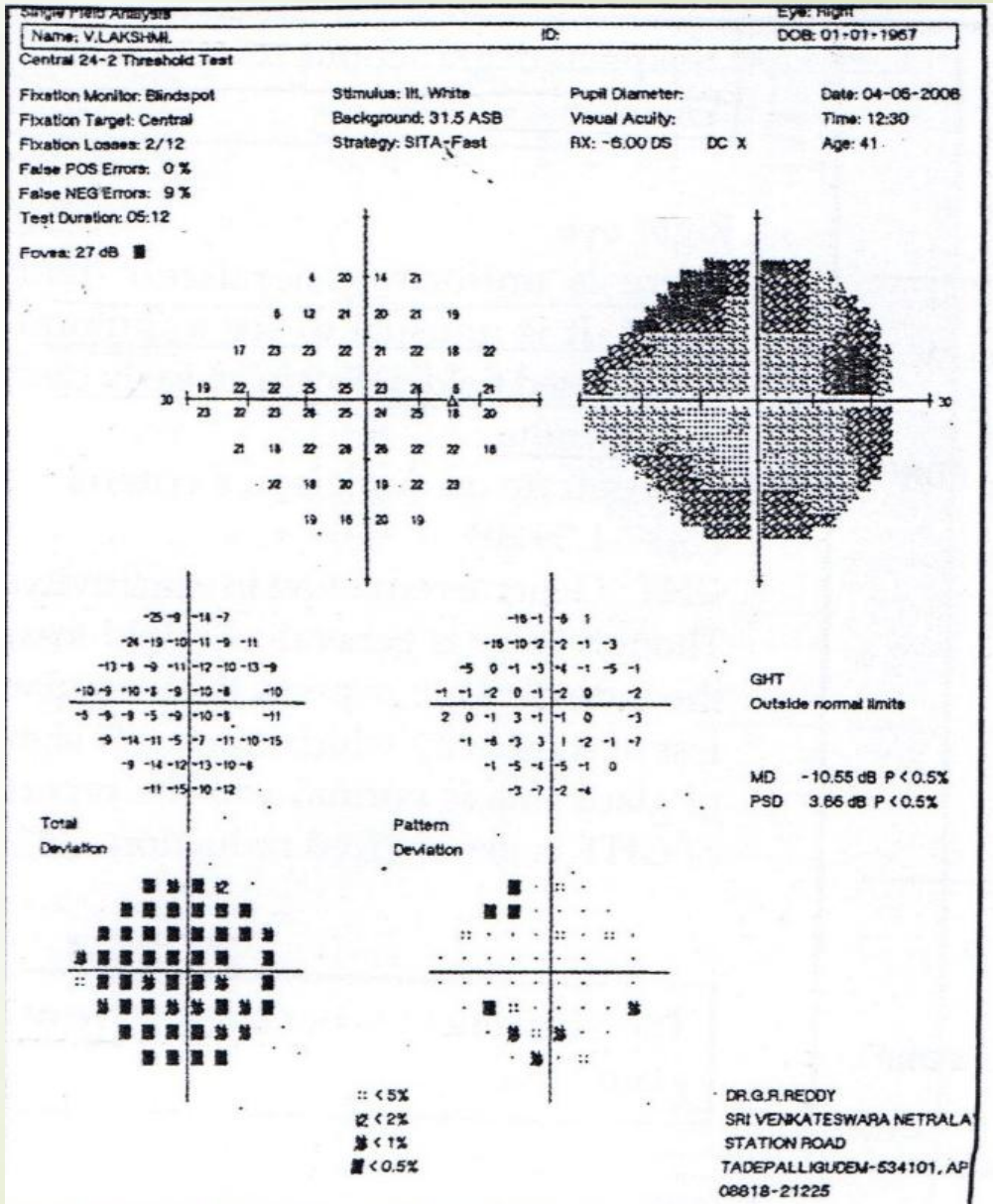
P < 1% indicates that this degree of loss sensitivity of that point is seen in < 2% of normal population. The P< 1% is represented by- < 1%

P < 5% indicates that this degree of loss sensitivity of that point is seen in < 2% of normal population. The P< 5% is represented by- ■ < 5%

:: P < 5%
P < 2%
P < 1%
■ P < 0.5%

# Zone 6 ( Pattern deviation plot )

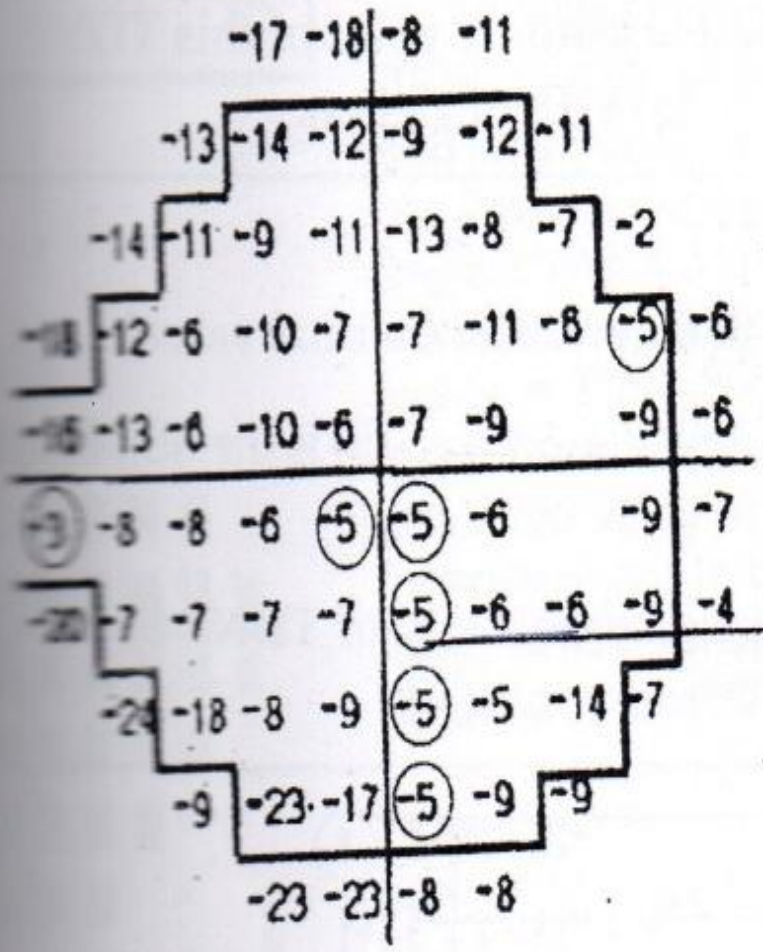
- It highlights focal changes which are hidden with in the diffuse changes by making adjustments for the height of the hill of vision.



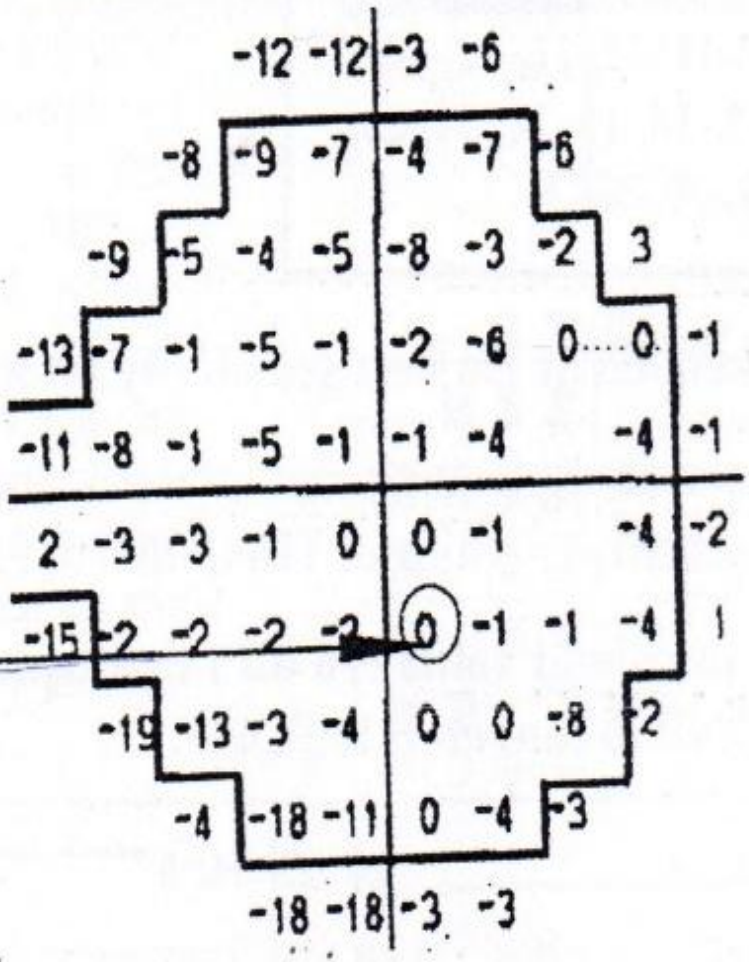
# Conversion of total deviation numerical plot to pattern deviation numerical plot

- The most important key point for the conversion of total deviation numerical plot to pattern deviation of numerical plot is the selection of 7th best sensitivity point of total deviation numerical plot. The dB value that converts the 7th best sensitivity point of the total deviation numerical plot to 0 deviation,added to all points of total deviation numerical plot to convert it to pattern deviation numerical plot.
- The computer selects the 7th best sensitivity point in the deviation numerical plot after ignoring the above mentioned point.

Total deviation numerical plot



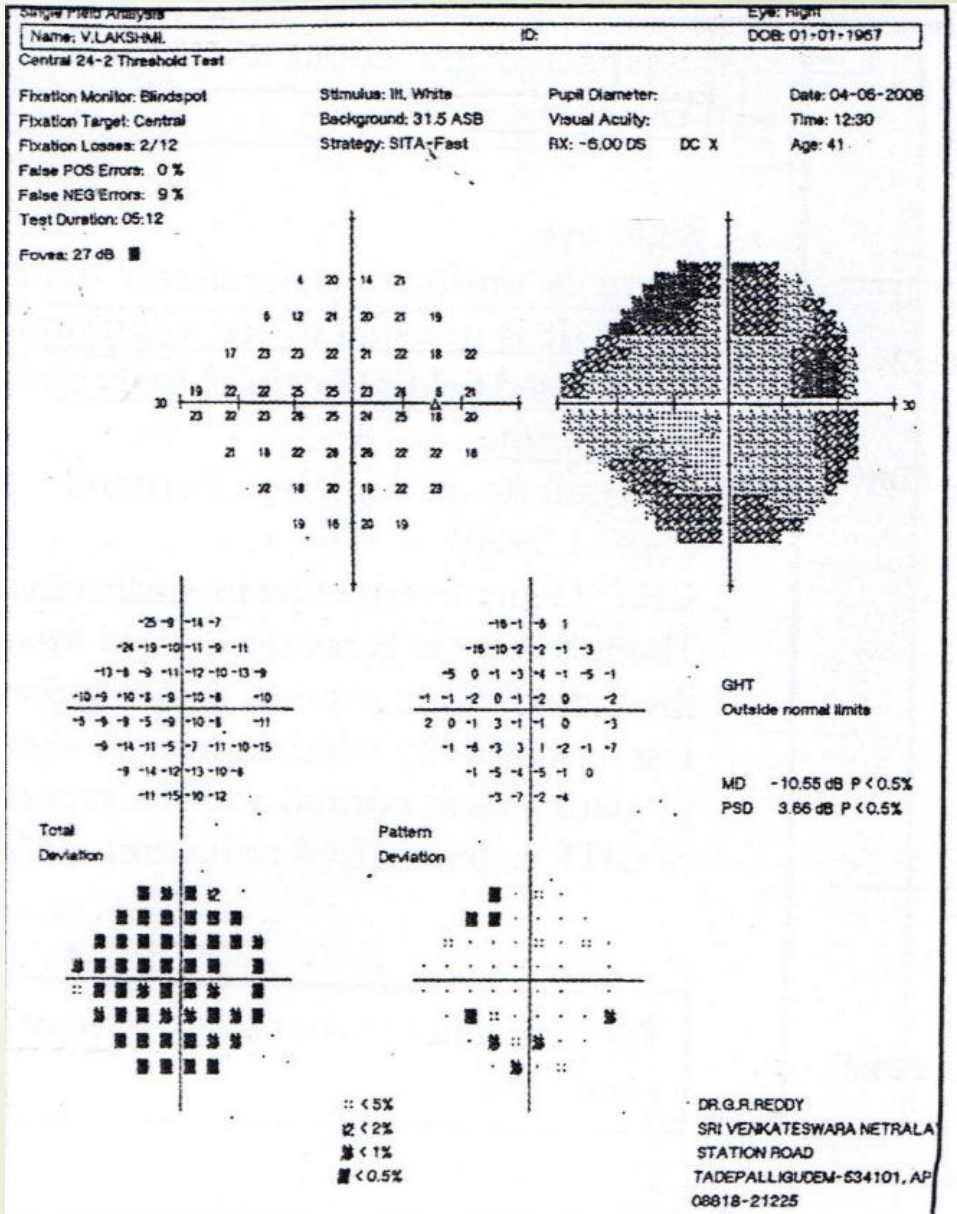

Pattern deviation numerical plot




Adjustment of general height of vision: The outer set of points of 30-2 are eliminated as shown in the figure and the 7th best point of the remaining 51 points is adjusted to 0 deviation.

# Pattern deviation probability plots

- The pattern deviation probability plot will never show generalised depression and pattern deviation numerical plot always will have at least seven points without loss of sensitivity
- In case of generalised field defect the pattern deviation probability plot helps to pick up glaucoma by highlighting the pattern of field defect.



- A black square in the probability plot does not mean that it is an absolute scotoma. It only tells that loss of retinal sensitivity has P value < 0.5% at that point. Never assess the depth of field defect from probability plots.

# Zone 7 ( Global indices )

- MD
- PSD

Mean Deviation ( MD):

- An average deviation of pt's visual field from age matched control
- It is avg of all the no. shown in TDNP
- It is the weighted score of all points on the *total deviation plot*. Indicate *generalized depression*.
- "+" → better than expected for age matched control
- "-" → worse than expected for age matched control

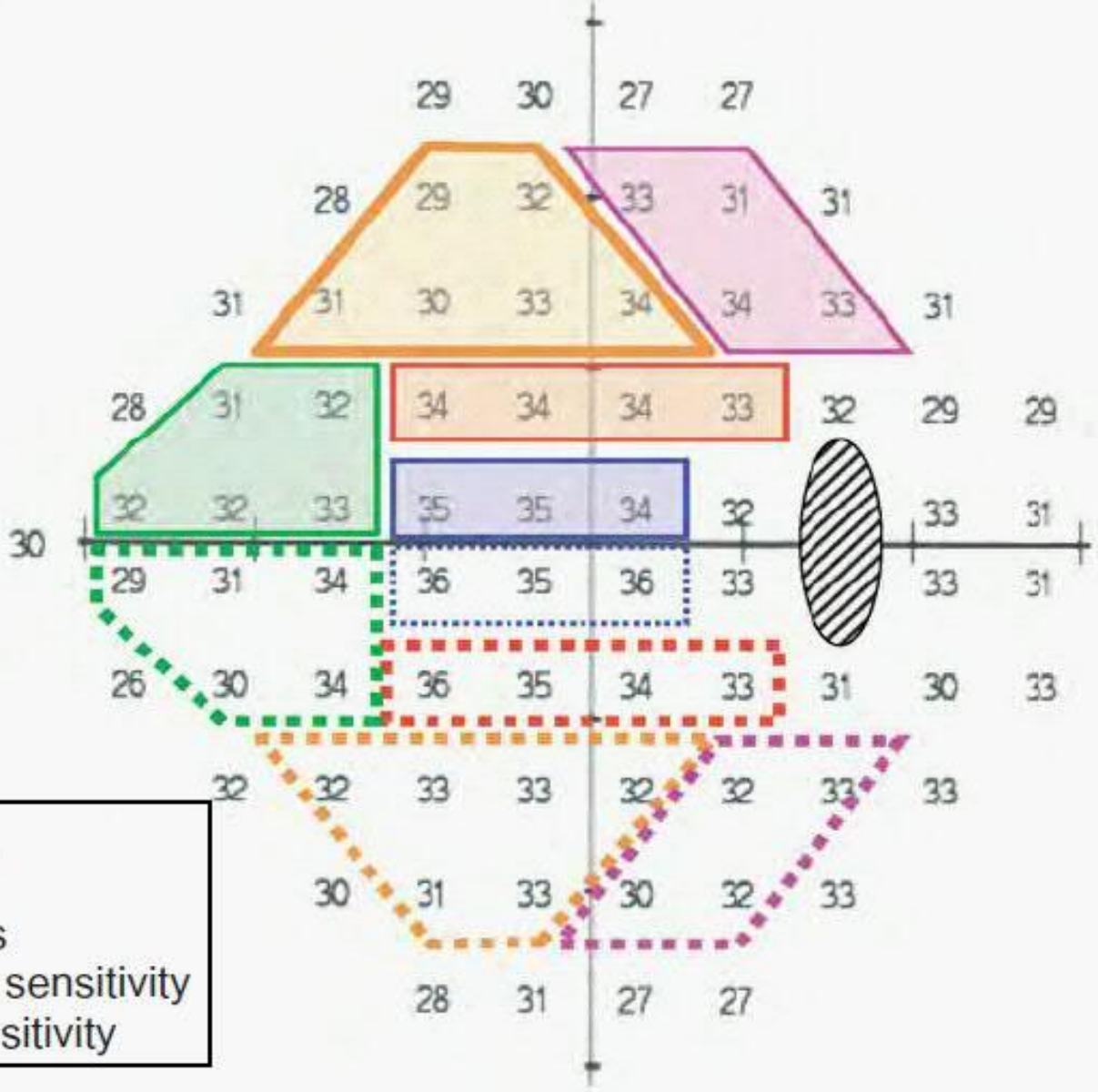
# Pattern Standard Deviation( PSD)

- PSD- Value of 2dB or greater will have p value indicating significance of deviation and Higher value indicate uneven field i.e. indicate focal loss.
- An increased PSD is therefore a more specific indicator of glaucomatous damage than MD.
- PSD with significant P value either be a pure localised field defect or a localised field defect in generalised depression( irregular generalised depression).
- ROLE OF PSD IN FOLLOW UP TESTS –

Increase in MD index and no change in PSD indicates that there is progression of field defect and its uniform generalised type.

# Glaucoma hemifield test(GHT)

- It compares the five clusters of points in the upper field(above the horizontal line) with the five mirror images in the lower field
- Developed based on the anatomical distribution of nerve fibres and are specific to the detection of glaucoma
- Depending upon differences between upper and lower cluster of points ,the folllowing five messages may be displayed:




Diagnostic outcomes
- within normal limits
- outside normal limits
- general reduction in sensitivity
- abnormally high sensitivity

. Borderline

***Figure 6.11*** Optic nerve fiber sectors (solid lines) and their mirror images (dotted lines) used for comparison in the Glaucoma Hemifield Test of the Humphrey Field Analyzer

- Outside normal limits: It denotes that either the values between upper and lower clusters differ to an extent found in less than 1% of population or any one pair of clusters is depressed to the extent that would be expected in less than 0.5% of population

- Border line : It is when the difference between any one of the upper and lower mirror clusters is what might be expected in less than 3% of population

- General reduction in sensitivity : It is when the best part of visual field is depressed to an extent expected in less than 0.5% of population

- Abnormally high sensitivity : It is labelled when the best part of visual field is such as would be found in less than 0.5% of population

- Within normal limits : It is considered when none of the above criteria is met

# ANDERSON CRITERIA 1: probability plots

- There should be a minimum of three non edge adjacent or cluster points in an expected location with significant P values either in total deviation probability plot( localised field defect) or in pattern deviation probability plot( generalised field defect).The P values of these 3 points should be as follows-

A. P value of 2 points should be < 5%

B. The remaining one point should have the P value < 1%.

The location of these points (expected location) should correspond to the disk changes

# Anderson's criteria 2:PSD and Anderson's criteria 3:GHT

- In single field analysis print out,GHT and PSD are developed to pick up the irregular loss of retinal senstivity( indices to represent irregular loss of retinal senstivity or to pick up early focal defects). They should be outside normal limits

PSD- P < 5%

GHT - Abnormal

Eye: Right

Name: B.SATYABAL | ID: | DOB: 01-03-1966

Central 24-2 Threshold Test

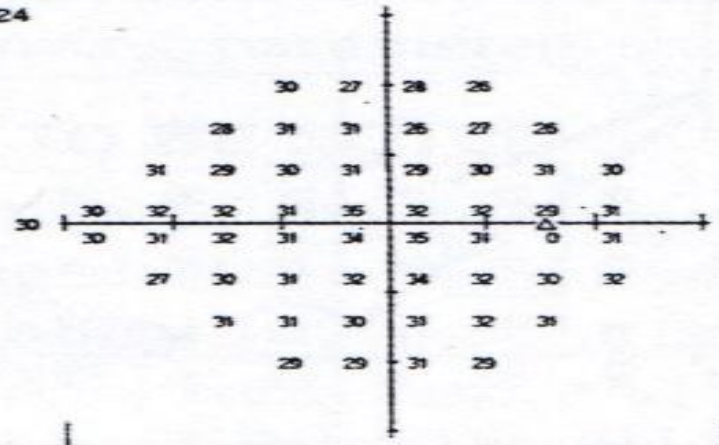
Fixation Monitor: Blindspot
Fixation Target: Central
Fixation Losses: 0/12
False POS Errors: 2 %
False NEG Errors: 0 %
Test Duration: 05:24

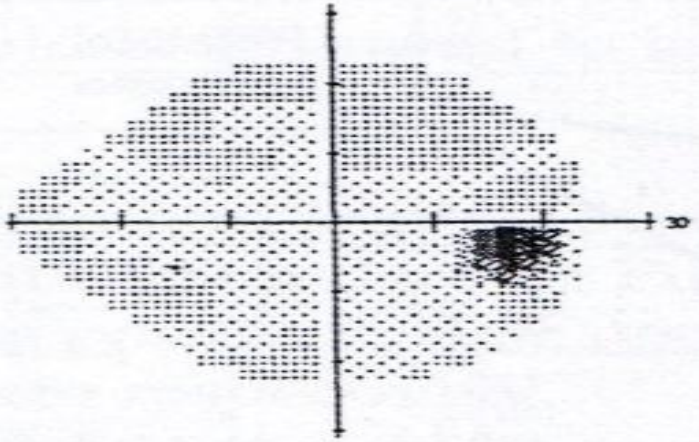
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard

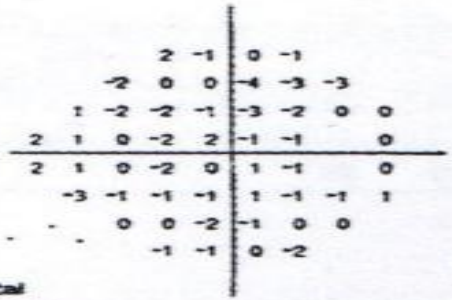
Pupil Diameter:
Visual Acuity:
RX: +4.50 DS DC X

Date: 22-12-2006
Time: 11:57
Age: 40

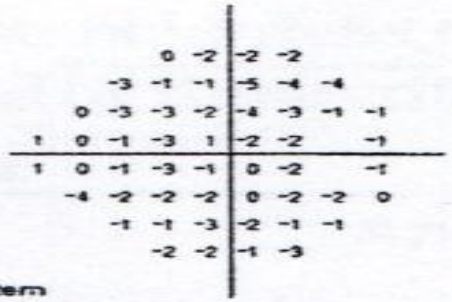
Fovea: 34 dB







Total Deviation



Pattern Deviation

GHT
Within normal limits

MD -0.71 dB
PSD 1.49 dB

:: < 5%
▨ < 2%
▩ < 1%
■ < 0.5%

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Single Field Analysis

Eye: Left

Name: B.SATYABAL | ID: | DOB: 01-03-1966

Central 24-2 Threshold Test

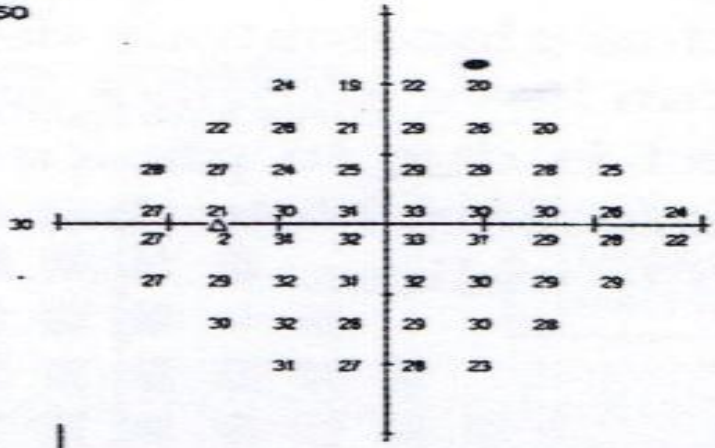
Fixation Monitor: Blindspot
Fixation Target: Central
Fixation Losses: 1/16
False POS Errors: 0 %
False NEG Errors: 3 %
Test Duration: 05:50

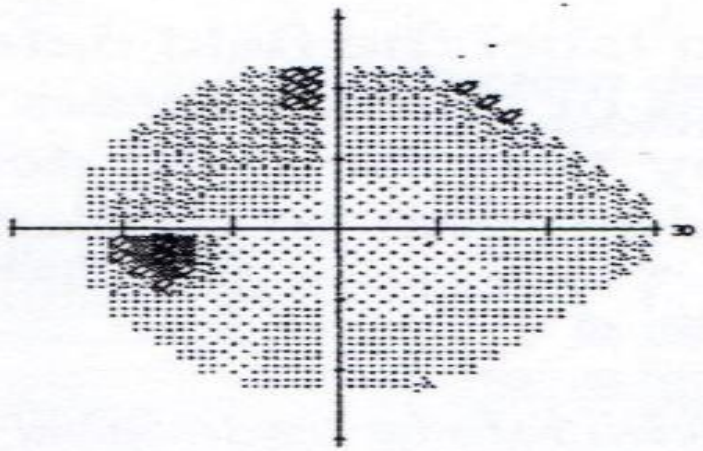
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard

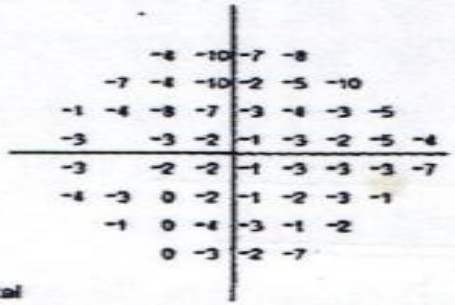
Pupil Diameter:
Visual Acuity:
RX: +4.50 DS DC X

Date: 22-12-2006
Time: 12:19
Age: 40

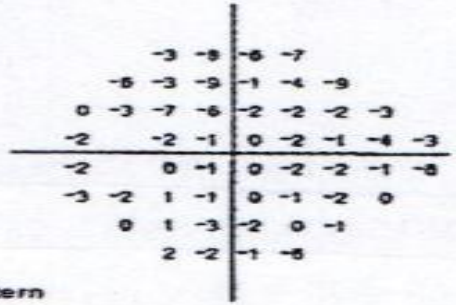
Fovea: 36 dB







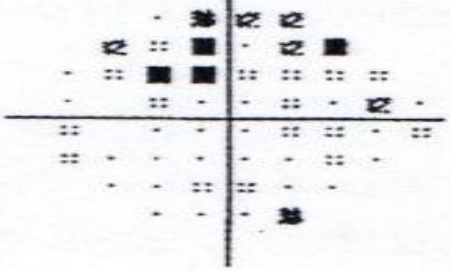
Total Deviation



Pattern Deviation

GHT
Outside normal limits

MD -3.16 dB P < 2%
PSD 2.47 dB P < 2%



:: < 5%
‼ < 2%
‽ < 1%
■ < 0.5%

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Name: P.VENKATALAKSHMI ID: DOB: 01-01-1950

Central 24-2 Threshold Test

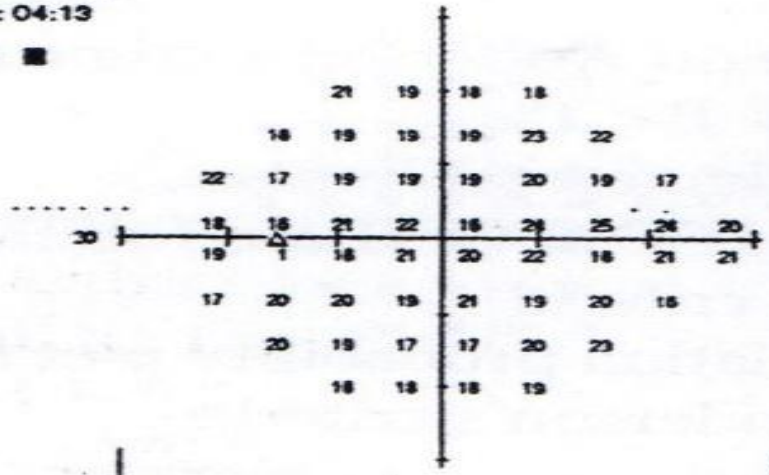
Fixation Monitor: Blindspot
Fixation Target: Central
Fixation Losses: 1/10
False POS Errors: 2 %
False NEG Errors: 0 %
Test Duration: 04:13

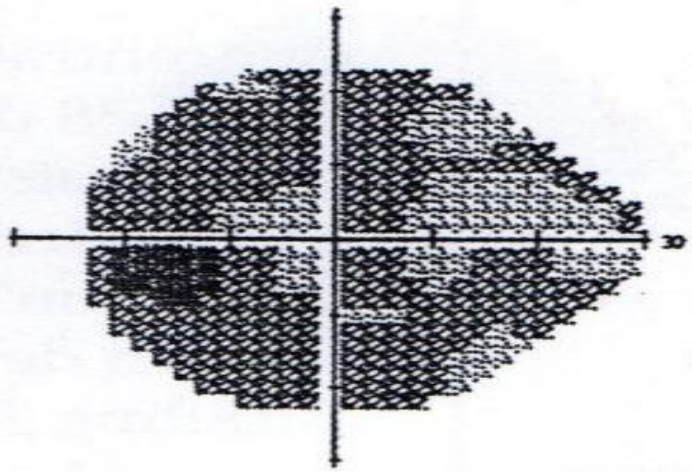
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Fast

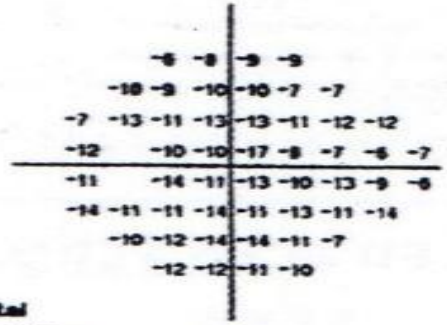
Pupil Diameter:
Visual Acuity:
RX: DS . DC X

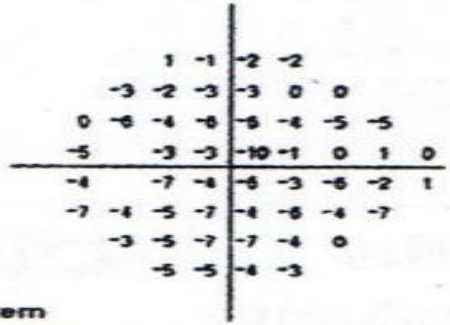
Date: 08-06-2008
Time: 11:48
Age: 58

Fovea: 24 dB



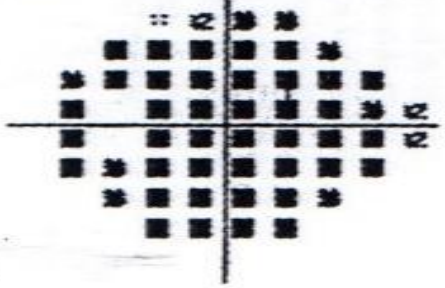





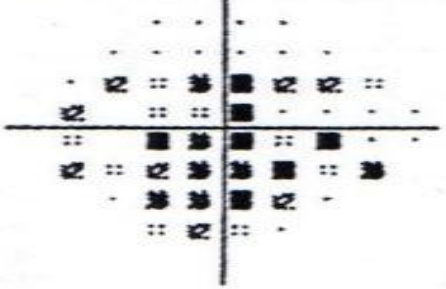
GHT
Outside normal limits

MD -10.85 dB P < 0.5%
PSD 2.62 dB P < 2%

Total Deviation



Pattern Deviation



:: < 5%
‼ < 2%
‼ < 1%
■ < 0.5%

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Single Field Analysis

Eye: Right

Name: P.VENKATALAKSHMI. ID: DOB: 01-01-1950

Central 24-2 Threshold Test

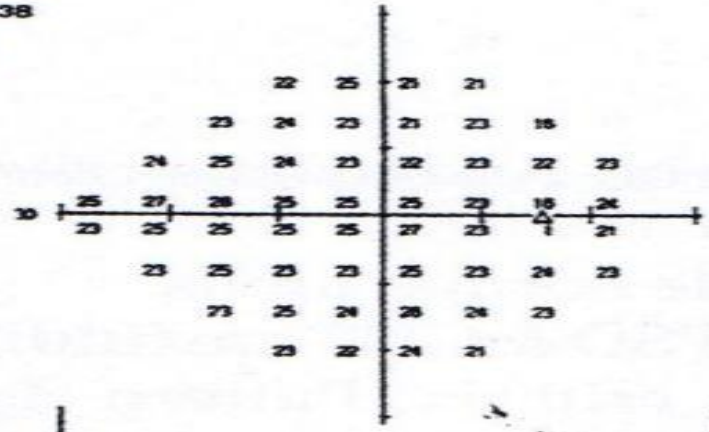
Fixation Monitor: Blindspot
Fixation Target: Central
Fixation Losses: 1/12
False POS Errors: 1 %
False NEG Errors: 10 %
Test Duration: 03:38

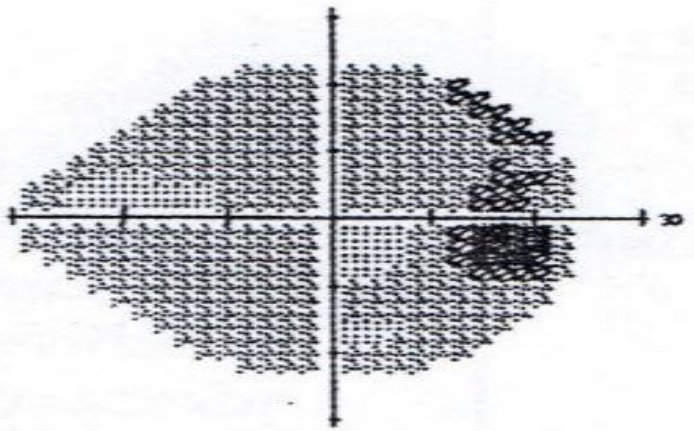
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Fast

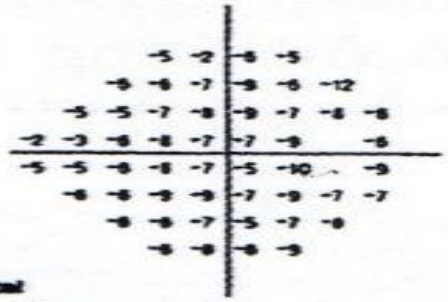
Pupil Diameter:
Visual Acuity:
RX: DS DC X

Date: 08-06-2008
Time: 11:28
Age: 58

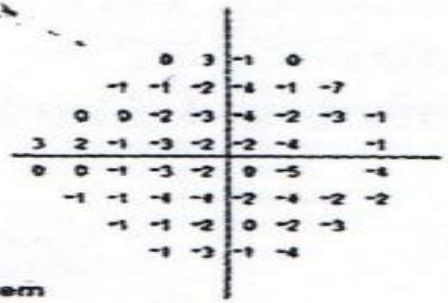
Fovea: 29 dB







Total Deviation



Pattern Deviation

GHT
General Reduction of Sensitivity

MD -6.79 dB P < 0.5%
PSD 1.79 dB P < 10%

:: < 5%
‼ < 2%
▒ < 1%
■ < 0.5%

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Name: V.LAKSHMI.

ID:

Eye: Left

DOB: 01-01-1967

Central 24-2 Threshold Test

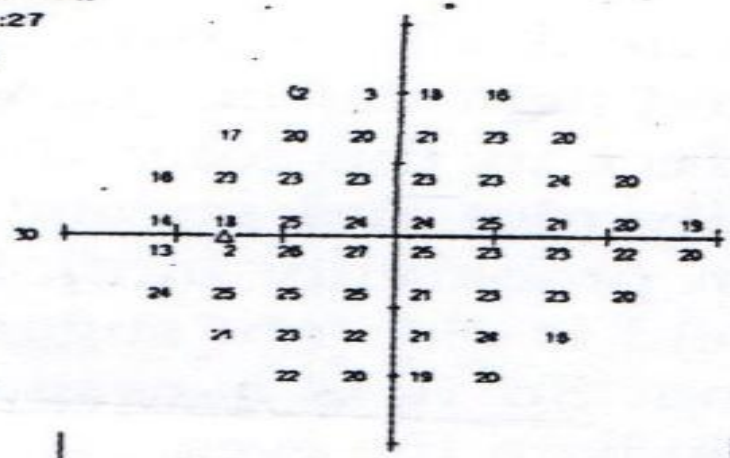
Fixation Monitor: Blindspot
Fixation Target: Central
Fixation Losses: 1/13
False POS Errors: 1 %
False NEG Errors: 12 %
Test Duration: 04:27

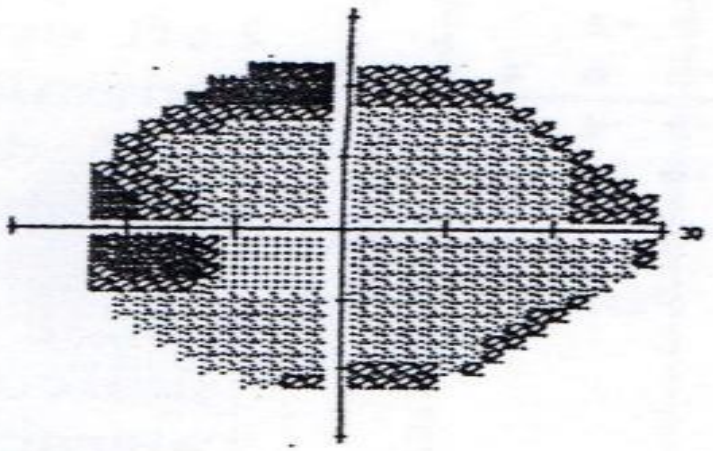
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Fast

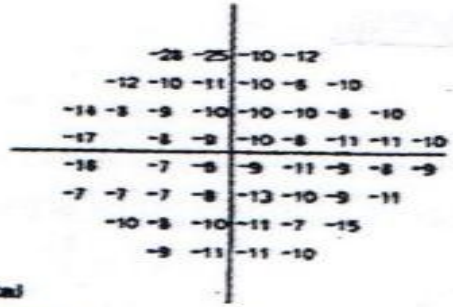
Pupil Diameter:
Visual Acuity:
RX: -6.00 DS DC X

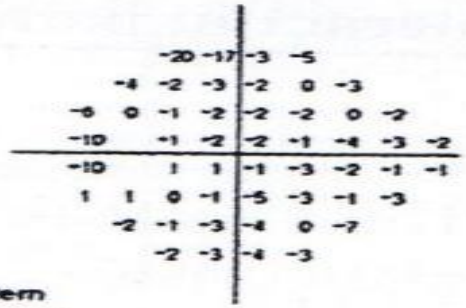
Date: 04-06-2008
Time: 12:41
Age: 41.

Fo[illegible]a: 28 dB







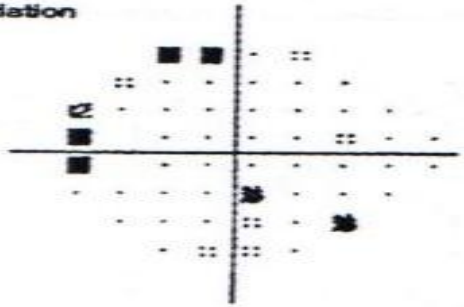


GHT
Outside normal limits

MD -10.22 dB P < 0.5%
PSD 3.38 dB P < 1%

Total Deviation

Pattern Deviation



:: < 5%
▨ < 2%
▩ < 1%
■ < 0.5%

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Single Field Analysis — Eye: Right

Name: V.LAKSHMI — ID: — DOB: 01-01-1967

Central 24-2 Threshold Test

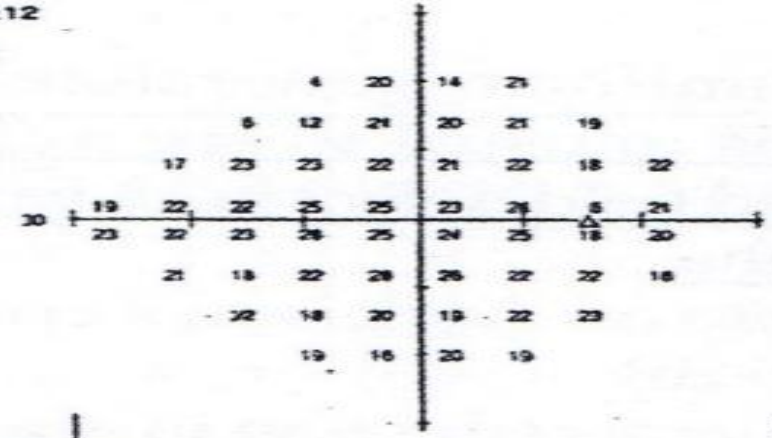
Fixation Monitor: Blindspot
Fixation Target: Central
Fixation Losses: 2/12
False POS Errors: 0 %
False NEG Errors: 9 %
Test Duration: 05:12

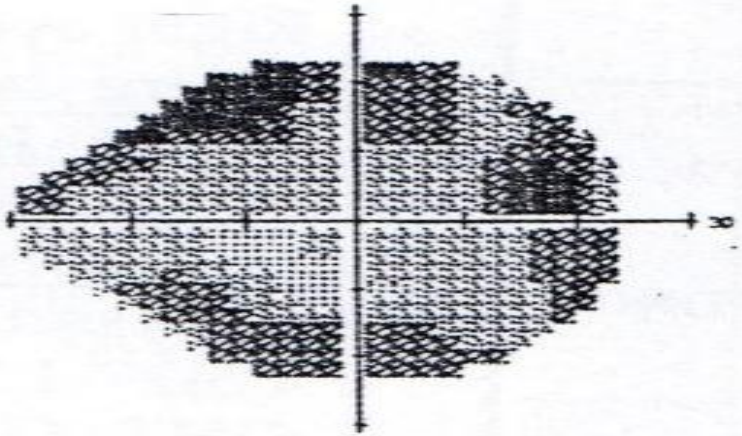
Stimulus: Wht, White
Background: 31.5 ASB
Strategy: SITA-Fast

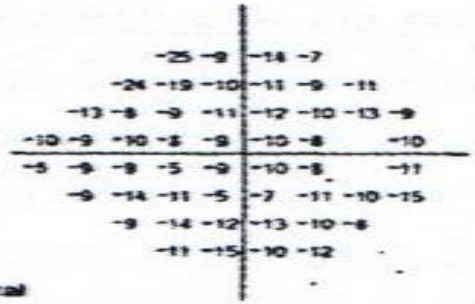
Pupil Diameter:
Visual Acuity:
RX: -6.00 DS DC X

Date: 04-06-2008
Time: 12:30
Age: 41

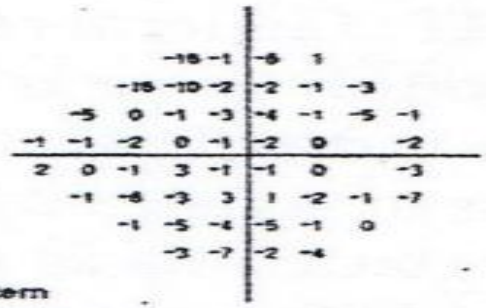
Fovea: 27 dB







Total Deviation



Pattern Deviation

GHT
Outside normal limits

MD -10.55 dB P < 0.5%
PSD 3.66 dB P < 0.5%

:: < 5%
< 2%
< 1%
< 0.5%

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Single Field Analysis — Eye: Left

Single Field Analysis | Eye: Right

Name: V.KRISHNAMMA | ID: | DOB: 01-01-1948

Central 24-2 Threshold Test

Fixation Monitor: Blindspot | Stimulus: III, White | Pupil Diameter: | Date: 24-05-2008

Fixation Target: Central | Background: 31.5 ASB | Visual Acuity: | Time: 09:53

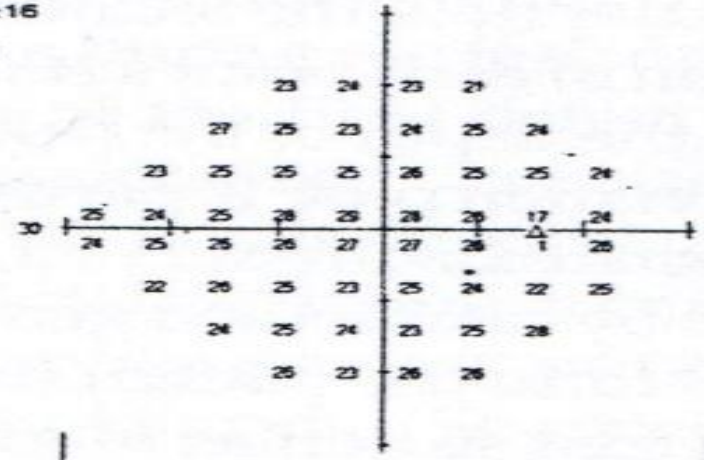
Fixation Losses: 2/16 | Strategy: SITA-Standard | RX: DS DC X | Age: 60

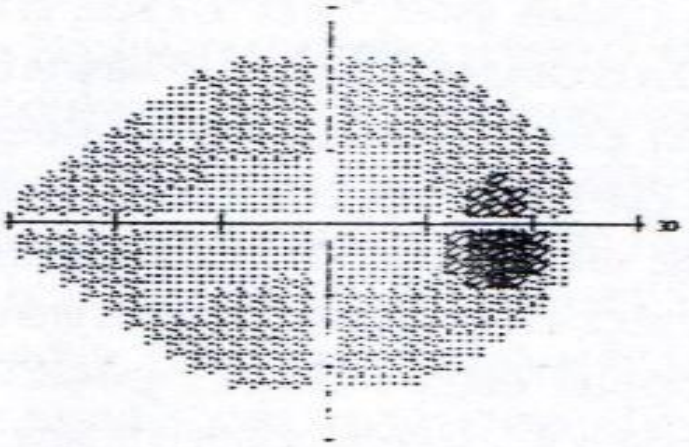
False POS Errors: 0 %

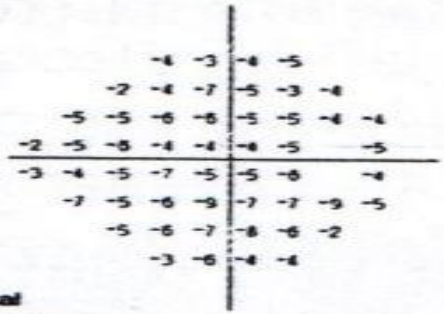
False NEG Errors: 3 %

Test Duration: 07:16

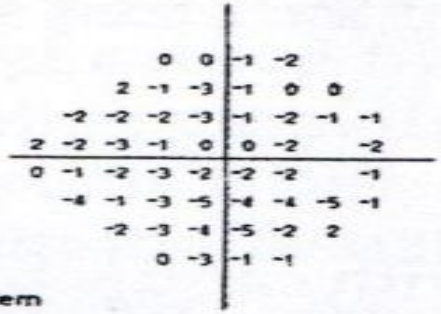
Fovea: 30 dB ■







Total Deviation



Pattern Deviation

GHT

General Reduction of Sensitivity

MD -5.21 dB P < 0.5%

PSD 1.59 dB

:: < 5%

▩ < 2%

▒ < 1%

■ < 0.5%

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Single Field Analysis

Name: V.KRISHNAMMA

ID:

Eye: Left

DOB: 01-01-1948

Central 24-2 Threshold Test

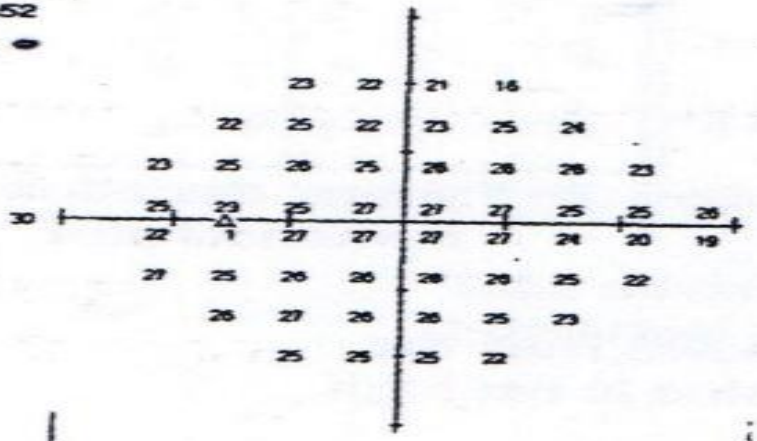
Fixation Monitor: Blindspot
Fixation Target: Central
Fixation Losses: 1/13
False POS Errors: 1 %
False NEG Errors: 5 %
Test Duration: 05:52

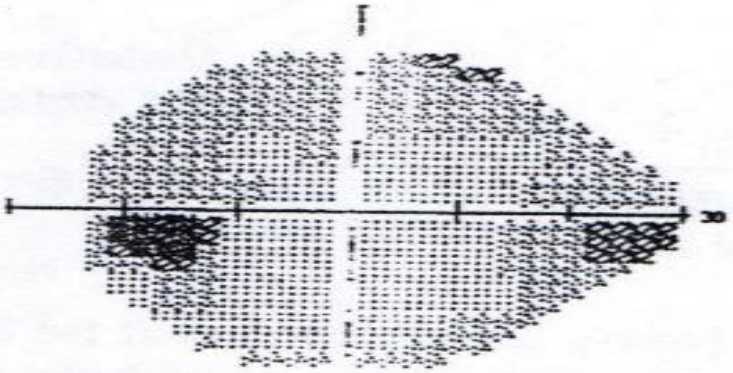
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard

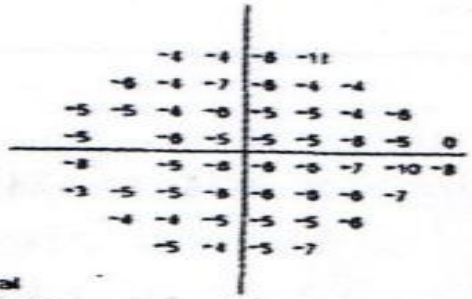
Pupil Diameter:
Visual Acuity:
RX: DS DC X

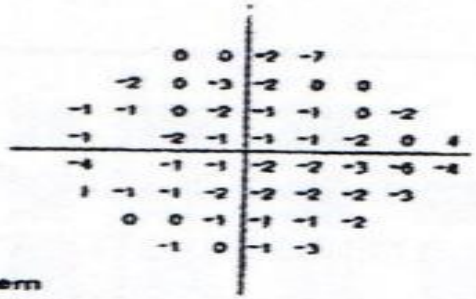
Date: 24-05-2008
Time: 10:09
Age: 60

Fovea: 30 dB









GHT
Glencral Reduction of Sensitivit

MD -5.45 dB P < 0.5%
PSD 1.44 dB

Total Deviation

Pattern Deviation

:: < 5%
▩ < 2%
▩ < 1%
■ < 0.5%

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08818-21225

Single Field Analysis

Name: T.VENKATESWAR RAO. ID: DOB: 02-01-1928

Central 24-2 Threshold Test

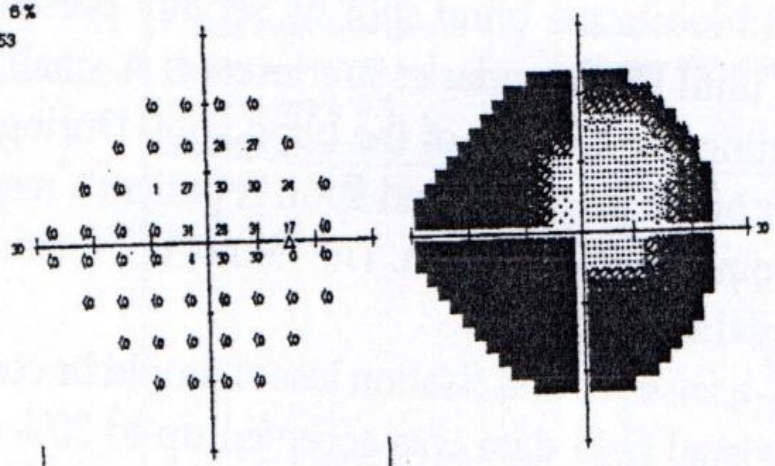
Fixation Monitor: Blind spot
Fixation Target: Central
Fixation Losses: 7/15 xx
False POS Errors: 0 %
False NEG Errors: 6 %
Test Duration: 05:53

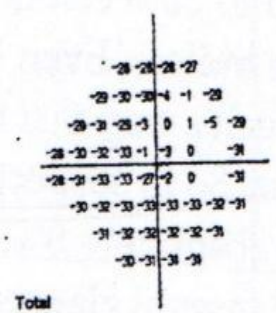
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard

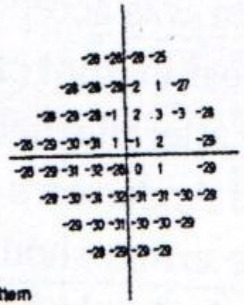
Pupil Diameter: 3.0 mm
Visual Acuity:
RX: DS DC X

Date: 29-05-2002
Time: 17:44
Age: 74

Fovea: 19 dB



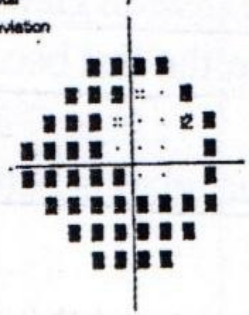




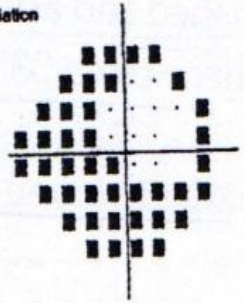
Low Patient Reliability
GHT
Outside normal limits

MD -24.05 dB P < 0.5%
PSD 13.69 dB P < 0.5%

Total Deviation



Pattern Deviation



:: < 5%
: < 2%
: < 1%
■ < 0.5%

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08818-21225

FIGURE 1

Name: T.VENKATESWAR RAO. ID: DOB: 02-01-1928

Central 24-2 Threshold Test

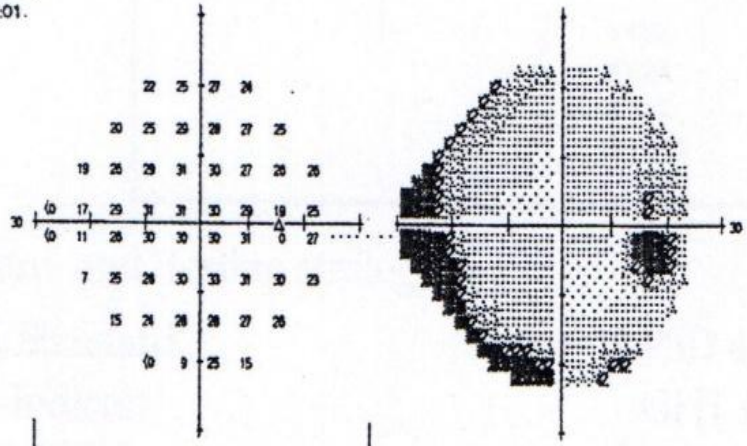
Fixation Monitor: Blind spot
Fixation Target: Central
Fixation Losses: 2/16
False POS Errors: 1 %
False NEG Errors: 8 %
Test Duration: 07:01

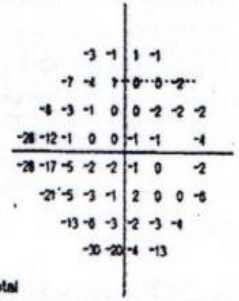
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard

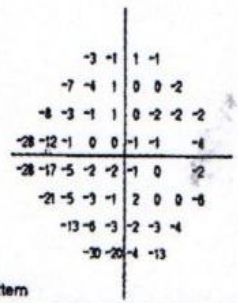
Pupil Diameter:
Visual Acuity:
RX: DS DC X

Date: 31-05-2002
Time: 10:58
Age: 74

Fovea: 32 dB



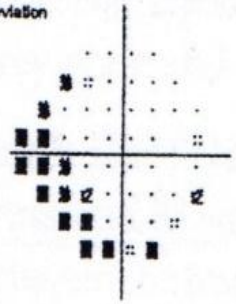




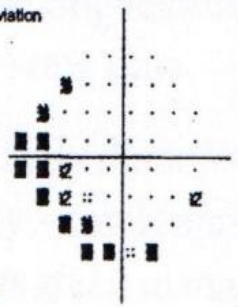
GHT
Outside normal limits

MD -4.35 dB P < 0.5%
PSD 7.10 dB P < 0.5%

Total Deviation



Pattern Deviation



:: < 5%
: < 2%
: < 1%
■ < 0.5%

DR.G.R.REDDY
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STATION ROAD
TADEPALLIGUDEM-534101, AP
08818-21225

FIGURE 2

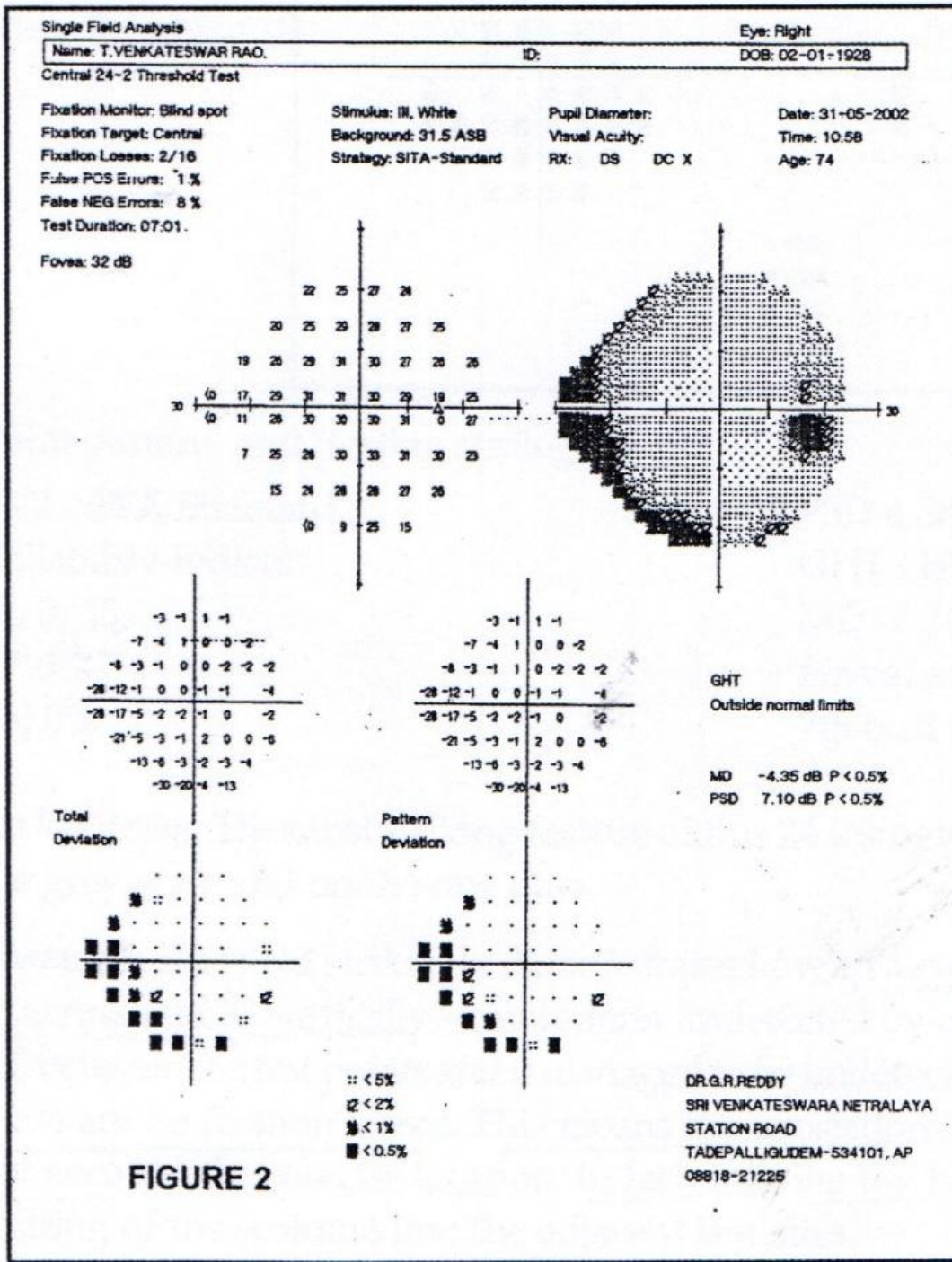
# The approach to interpret field defects in established cases

- The main aim in established case of glaucoma is to know the depth, extent of field defect and macular status. This information is important to plan the target IOP.
- In established cases of glaucoma there is little importance of pattern deviation probability plot.
- Always look at the raw data in established and advanced cases
- GHT and PSD in established cases of glaucoma:

these two will be abnormal but they will not play any significant role in established cases of glaucoma.

# Foveal status

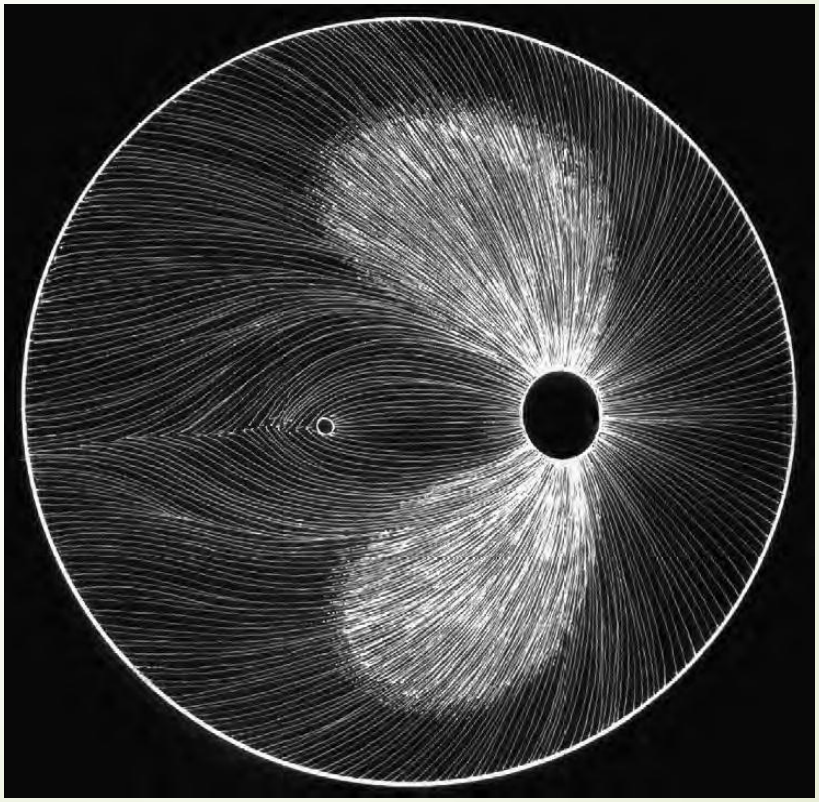
- If any of the points on the 3 degree circle has 0 dB senstivity, we have to test 3 degree area around fixation point to know the foveal status. But there are no points within 3 degree circle around fixation in 30-2 or 24-2 point patterns. So we have to select 10-2 or 6-2 custom test to know the senstivity of 3 degree area around fixation point.If any of the points on 1 degree circle has 0 dB senstivity in the raw data,then only we should say that there is foveal split.



# Distribution of retinal nerve fibres

1. Fibres from nasal half of retina come directly to the optic disc as superior and inferior radiating fibres
2. Those from the macular area come horizontally as papillomacular bundle
3. Fibres from the temporal retina arch above and below the macula and papillomacular bundle as superior and inferior arcuate fibres with a horizontal raphe in between

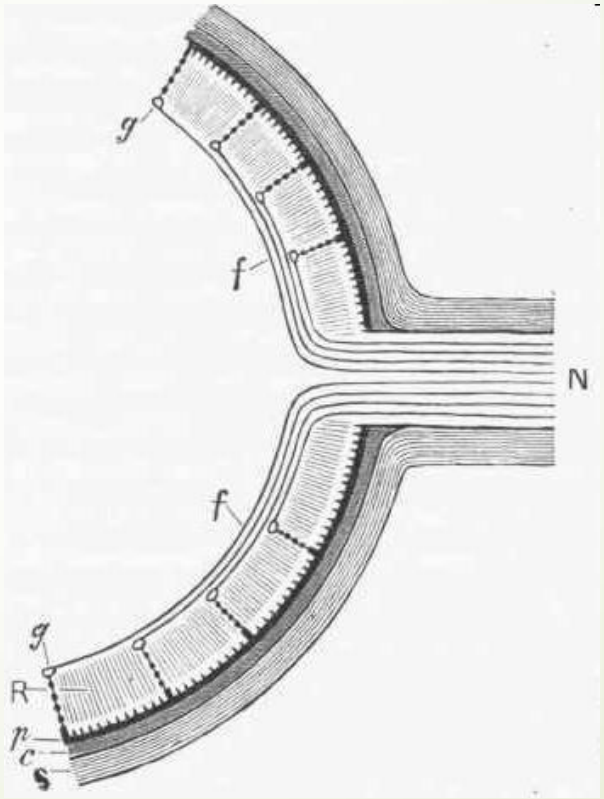
# Distribution of retinal nerve fibres



# Arrangement of nerve fibres within optic nerve head

- Those from the peripheral part of the retina lie deep in the retina but occupy the most peripheral(superficial) part of the optic disc
- Fibres originating closer to the nerve head lie superficially in the retina and occupy a more central(deep) portion of head

# Retinal nerve fibres in optic nerve head



- The arcuate fibres occupy the superior and inferior temporal portions of optic nerve head and are most sensitive to glaucomatous damage; accounting for early loss in the corresponding regions of the visual field
- Macular fibres are most resistant to the glaucomatous damage and explain the retention of the central vision till end

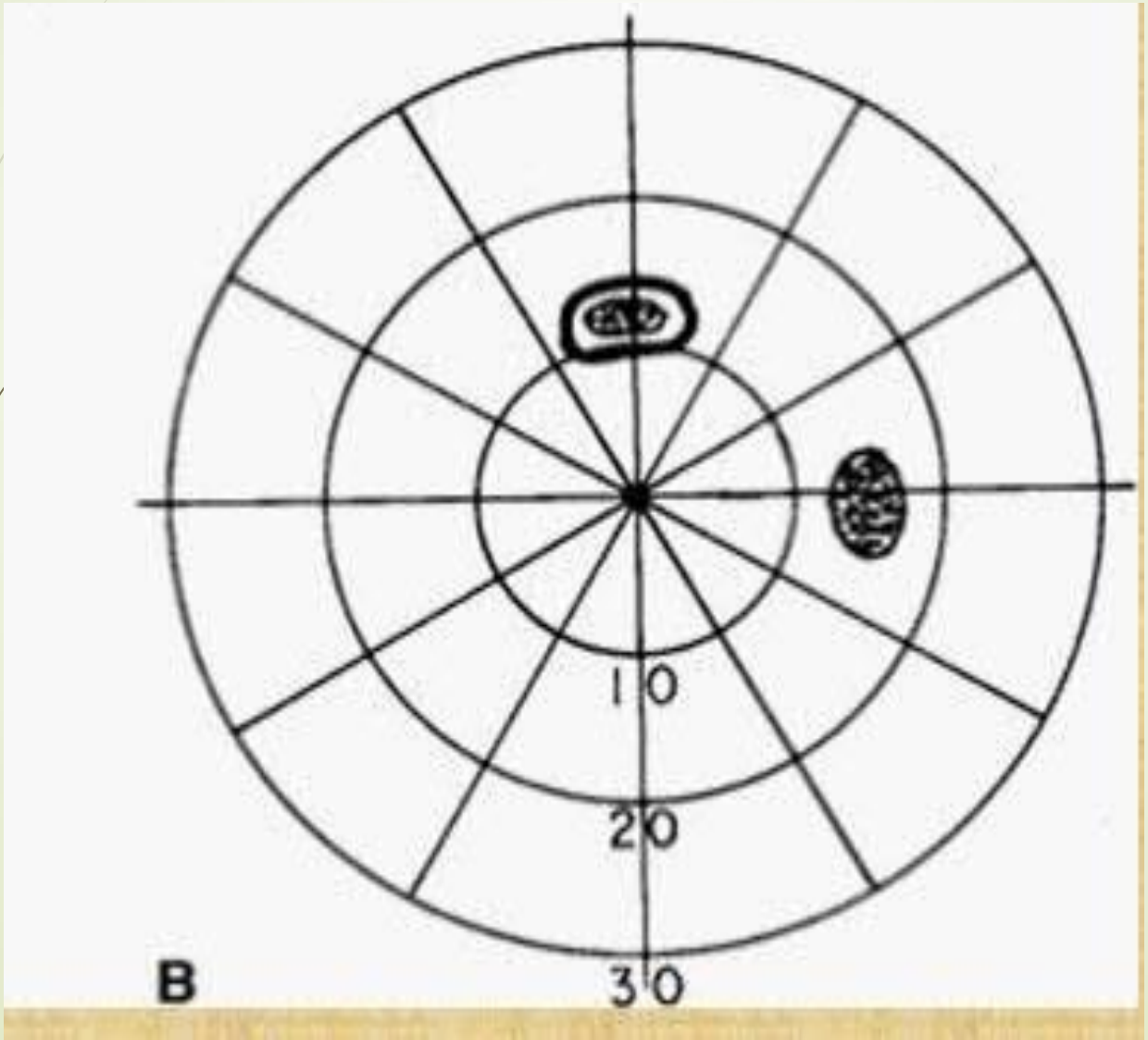
# Field defects in glaucoma

- Visual field defects in glaucoma are initially observed in bjerrum's area(10-25 degree from fixation
- The natural history of progressive glaucomatous field loss takes following sequence :

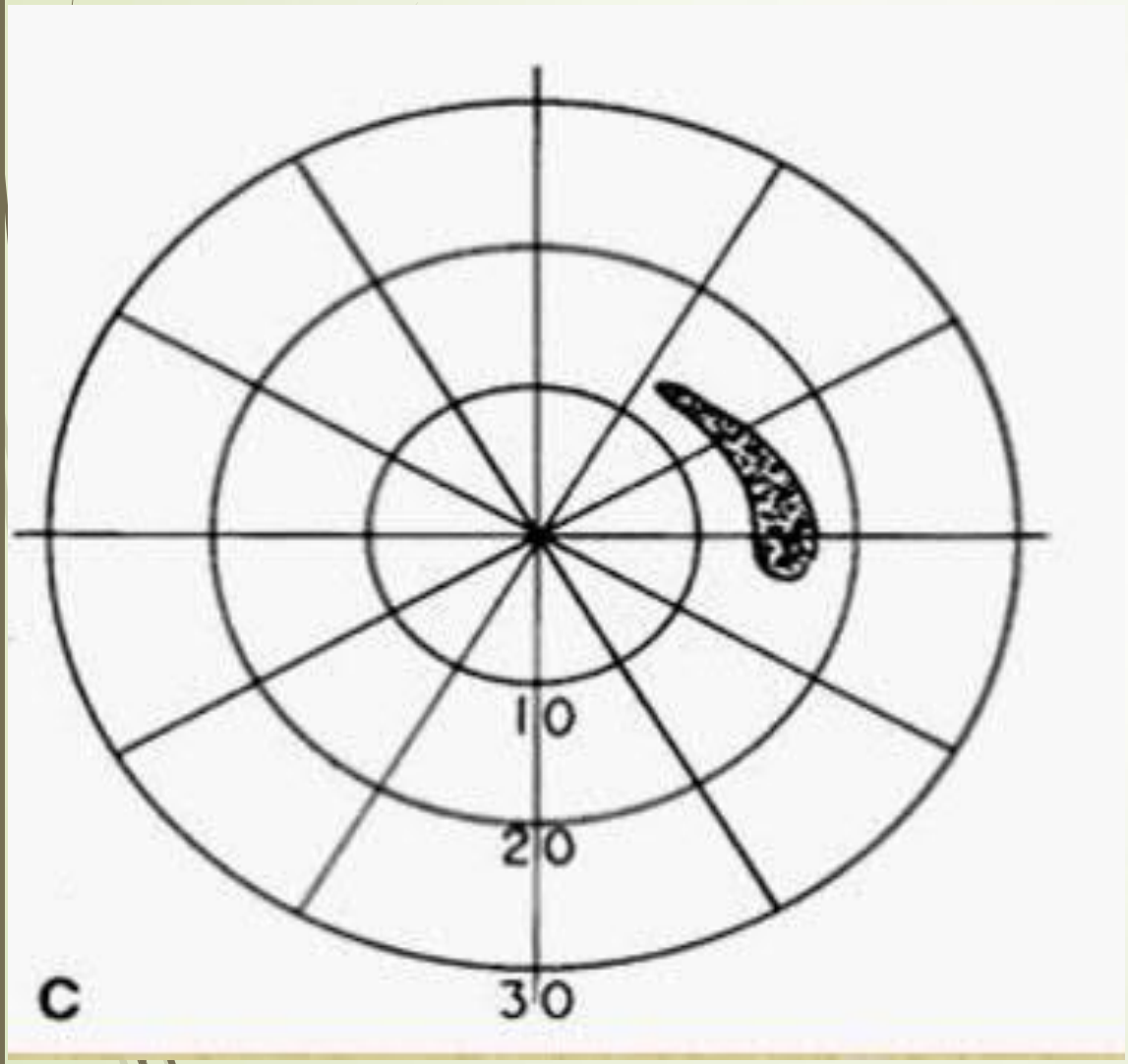
# Isopter contraction

- It refers to mild generalised constriction of central as well as peripheral field
- It is the earliest visual field defect occuring in glaucoma

# Paracentral scotoma



# Siedel's scotoma

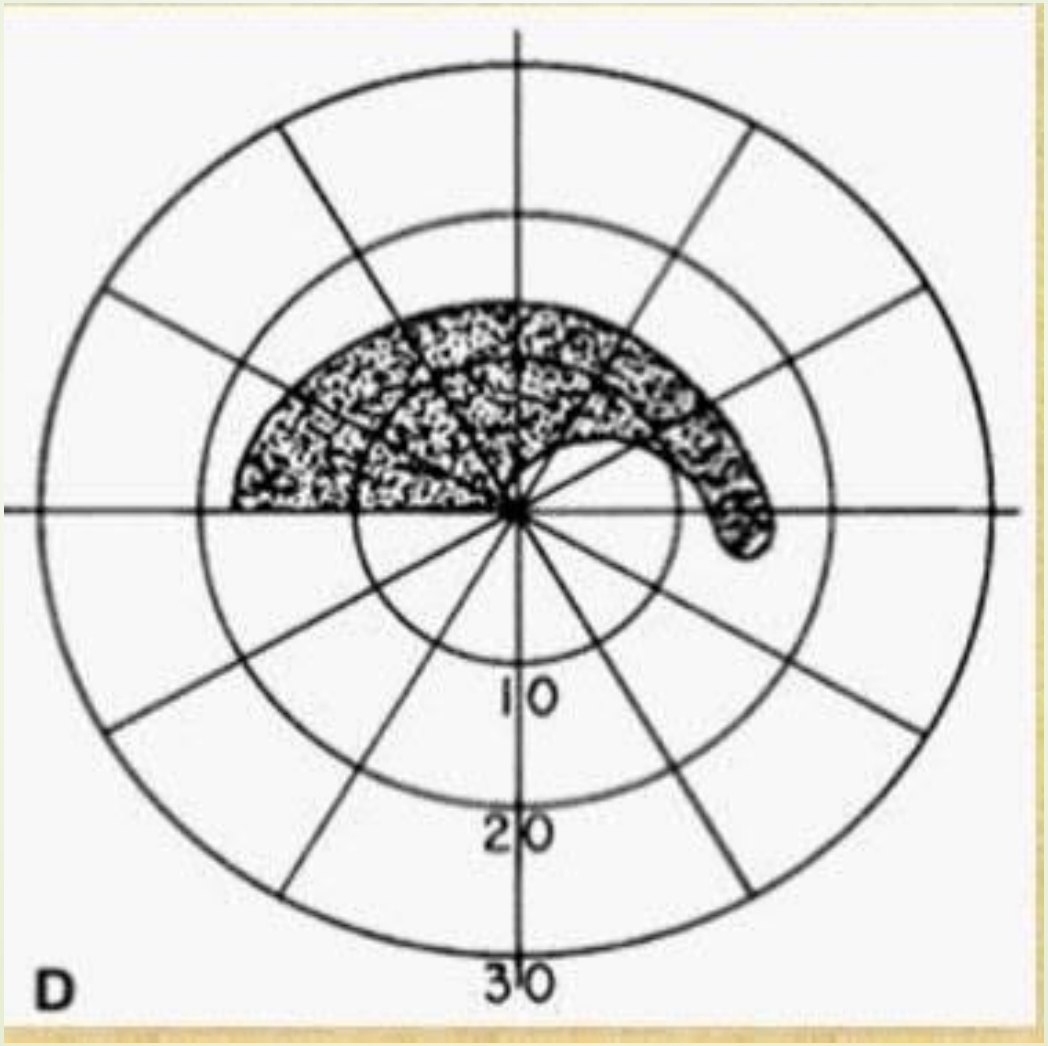



- With passage of time paracentral scotoma joins the blind spot to form a sickle shaped scotoma known as siedel's scotoma

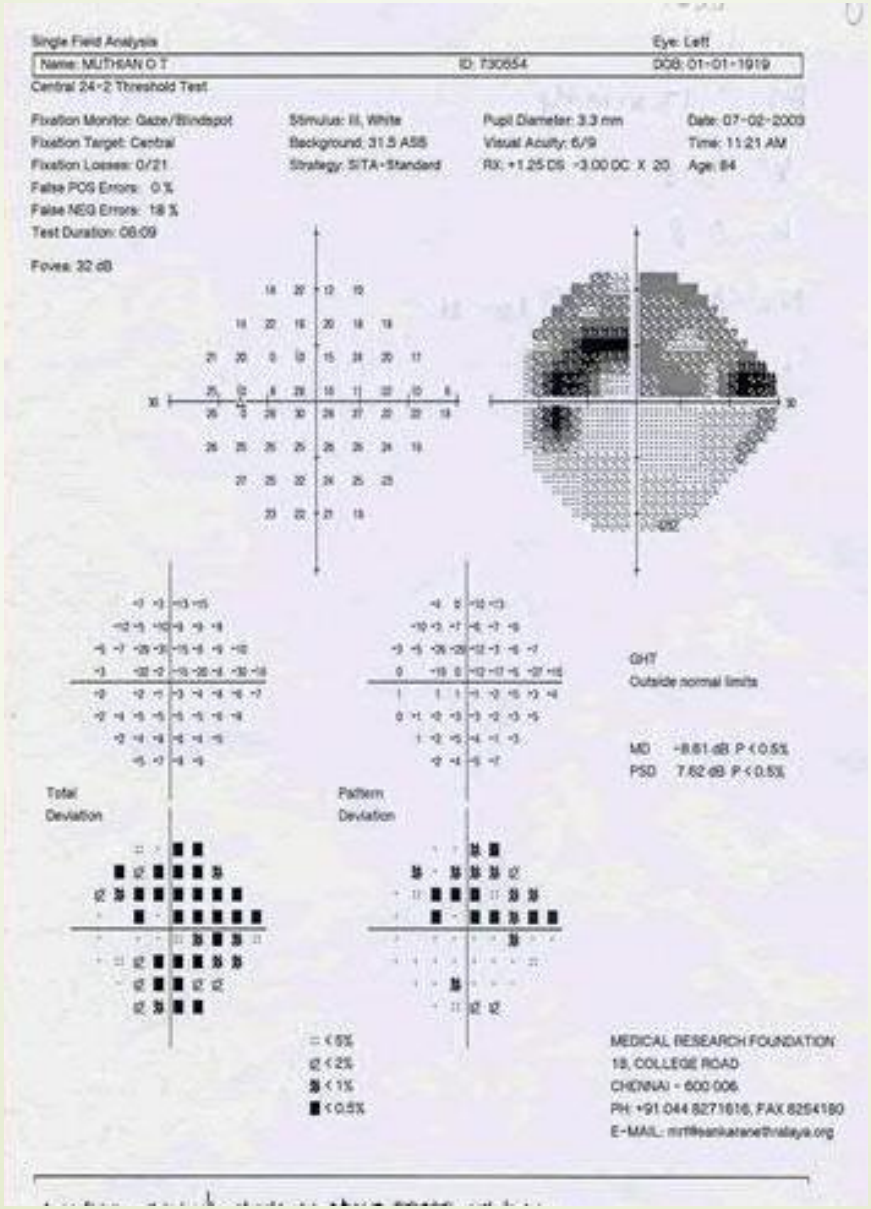
# Arcuate or bjerrum's scotoma

- It is formed at a later stage by the extension of Siedel's scotoma in an area either above or below the fixation point to reach the horizontal line

# Superior arcuate scotoma

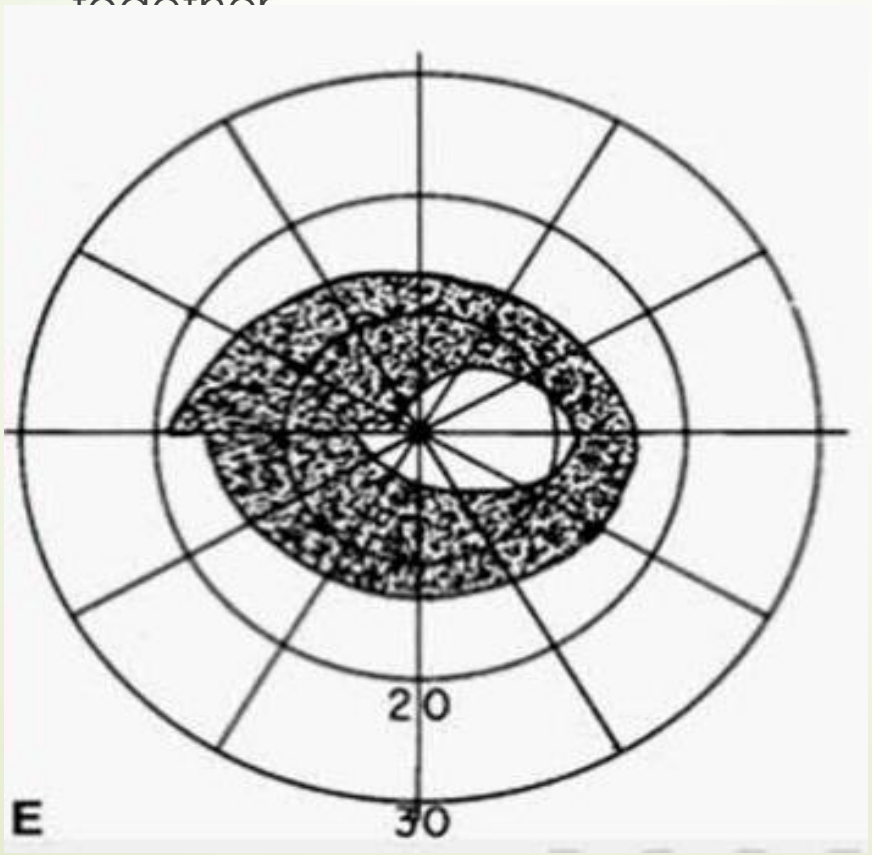


# Superior arcuate defect

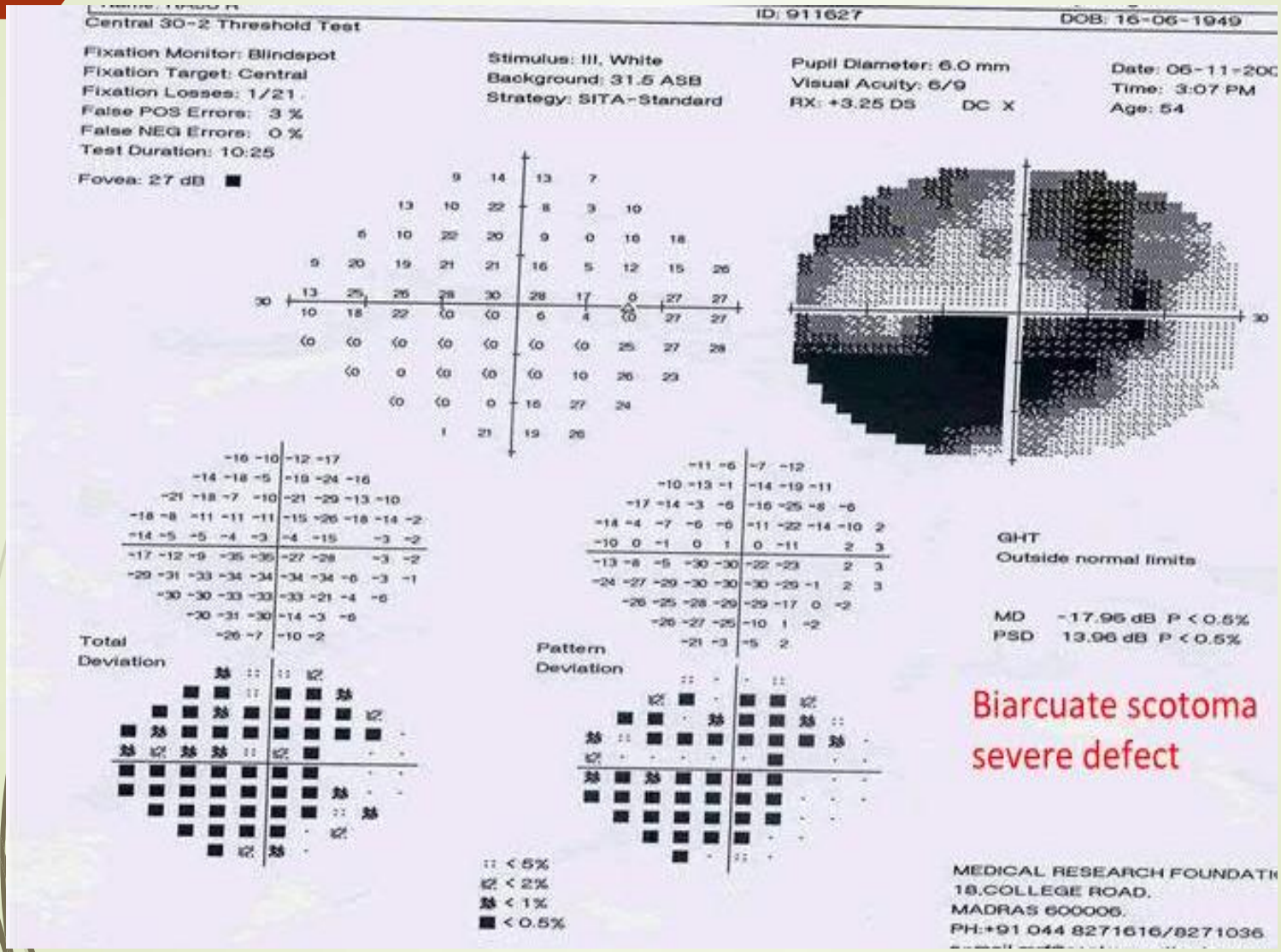


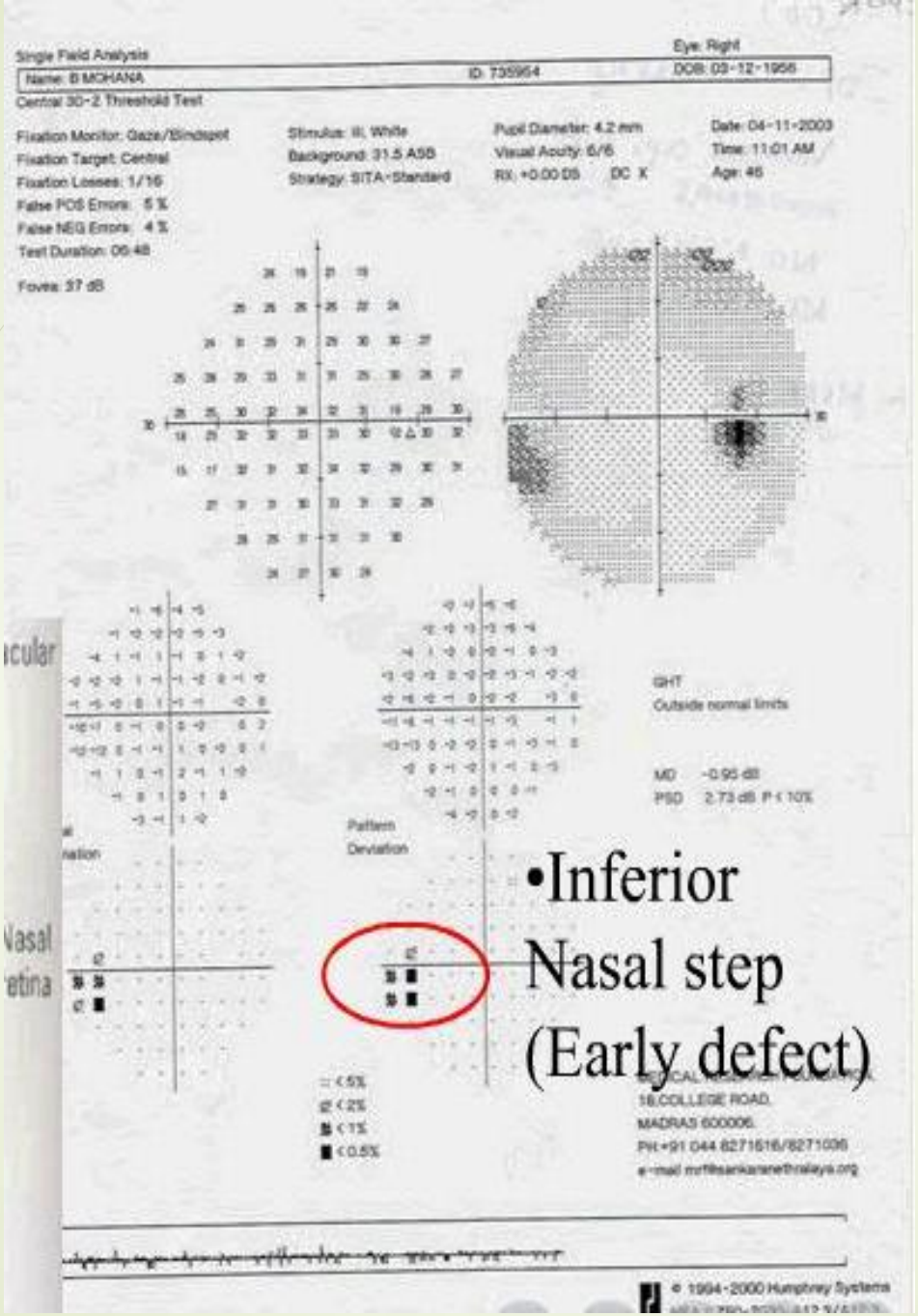
# Ring or double arcuate scotoma

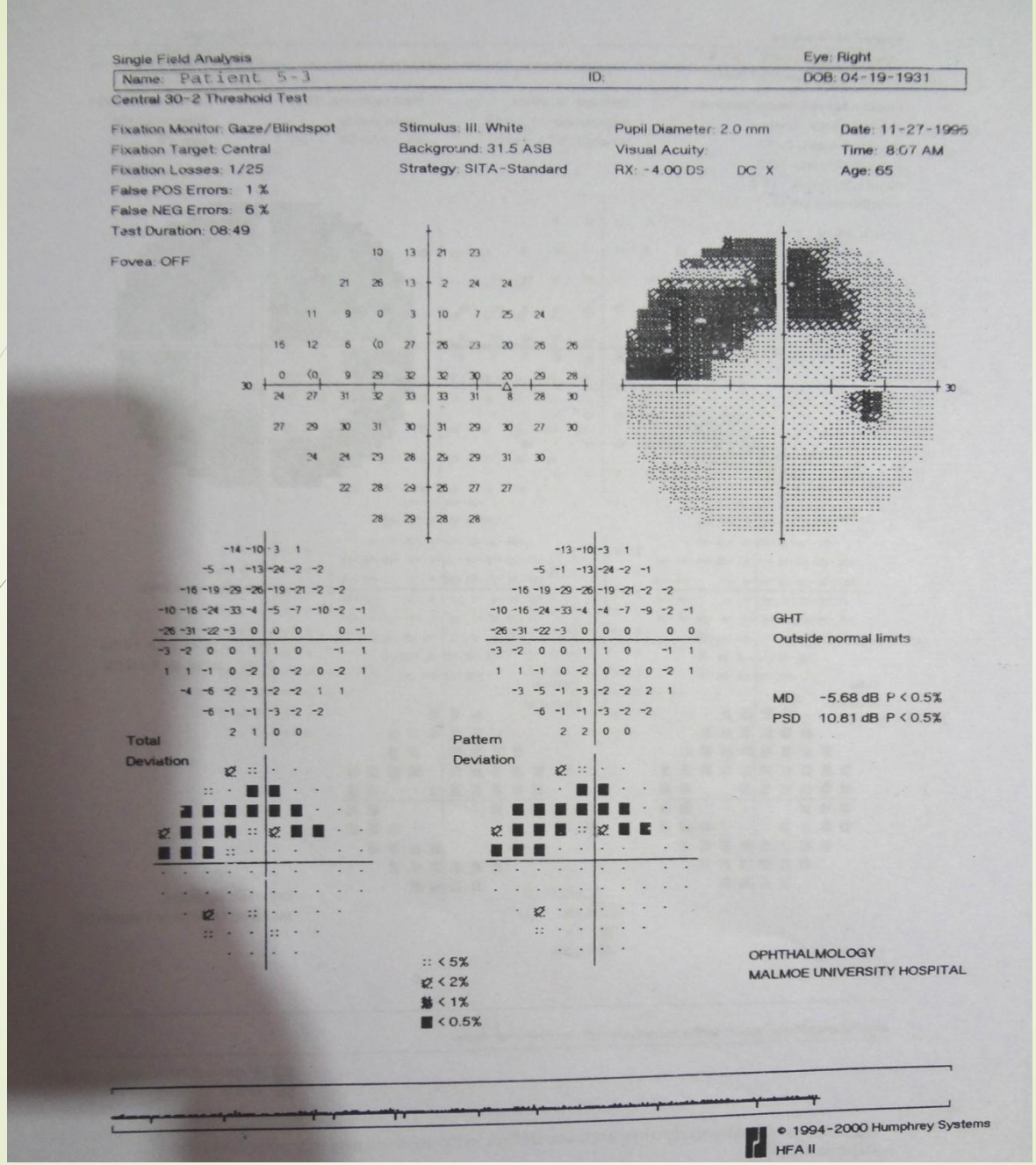
- It develops when the two arcuate scotomas join together



# Ring scotoma




Single Field Analysis
Eye: Right
Name: B MOHANA
ID: 735964
DOB: 03-12-1956
Central 30-2 Threshold Test
Fixation Monitor: Gaze/Blindspot
Fixation Target: Central
Fixation Losses: 1/16
False POS Errors: 5 %
False NEG Errors: 4 %
Test Duration: 06:48
Fovea: 37 dB
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard
Pupil Diameter: 4.2 mm
Visual Acuity: 6/6
Rx: +0.00 DS DC X
Date: 04-11-2003
Time: 11:01 AM
Age: 46
GHT
Outside normal limits
MD -0.90 dB
PSD 2.73 dB P < 10%
Pattern Deviation
•Inferior Nasal step (Early defect)
16,COLLEGE ROAD,
MADRAS 600006.
Ph:+91 044 8271616/8271036
© 1994-2000 Humphrey Systems




Superior arcuate scotoma

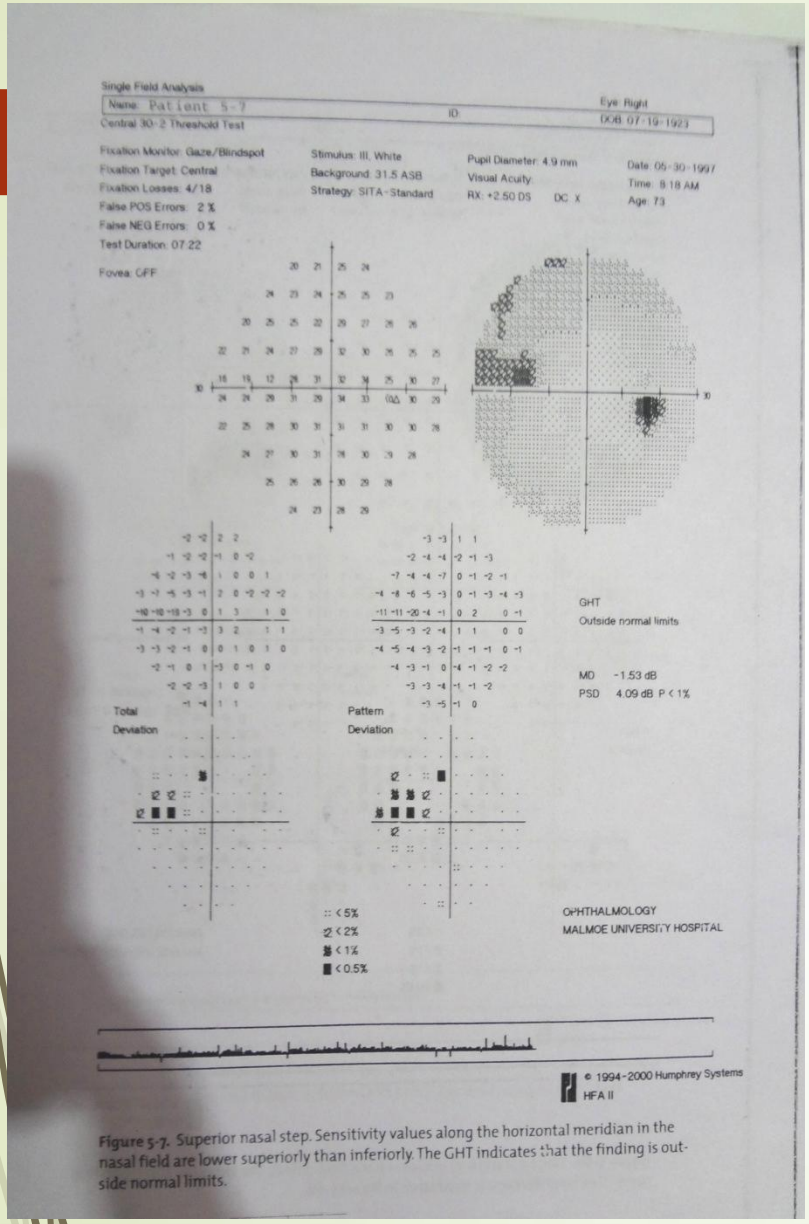



**Figure 5-7.** Superior nasal step. Sensitivity values along the horizontal meridian in the nasal field are lower superiorly than inferiorly. The GHT indicates that the finding is outside normal limits.

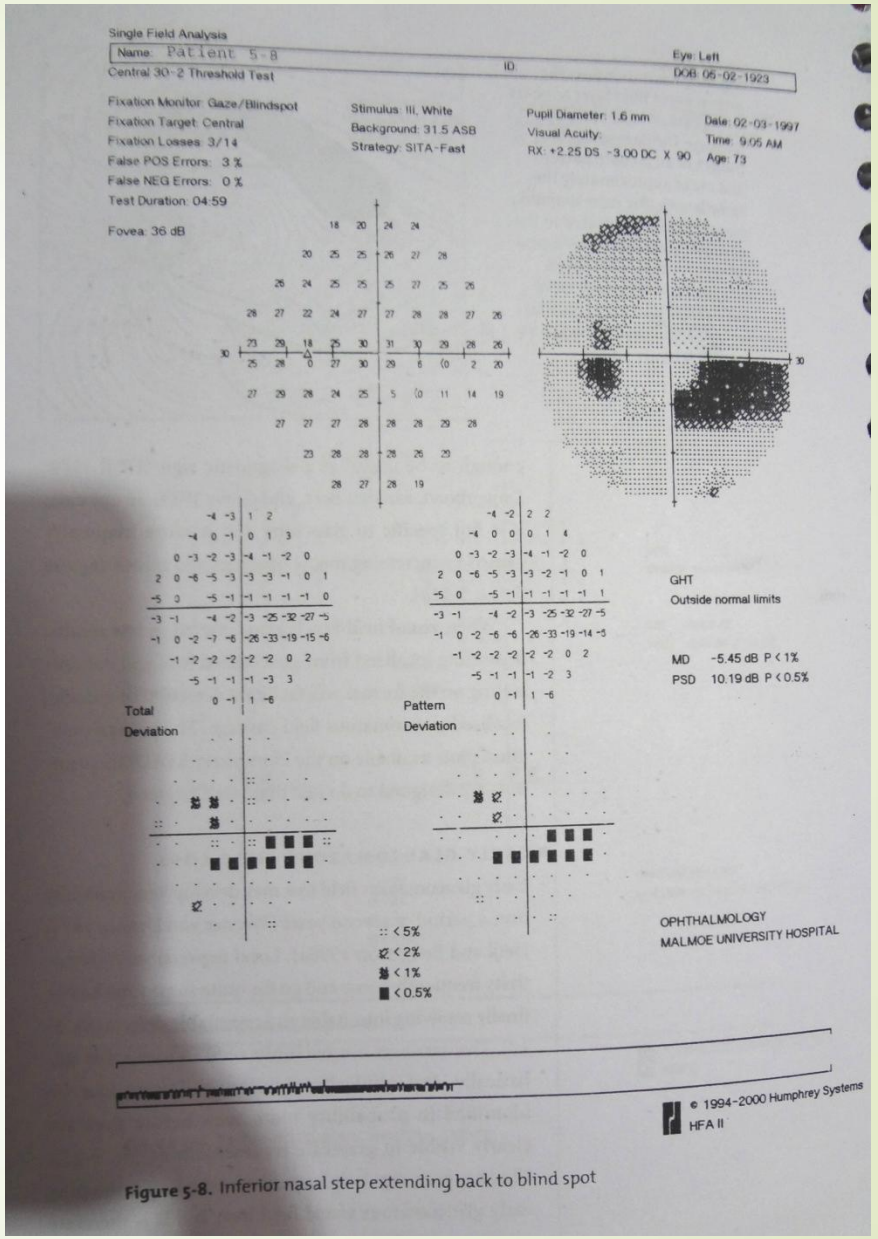



**Figure 5-8.** Inferior nasal step extending back to blind spot

Superior nasal step

Inferior nasal step

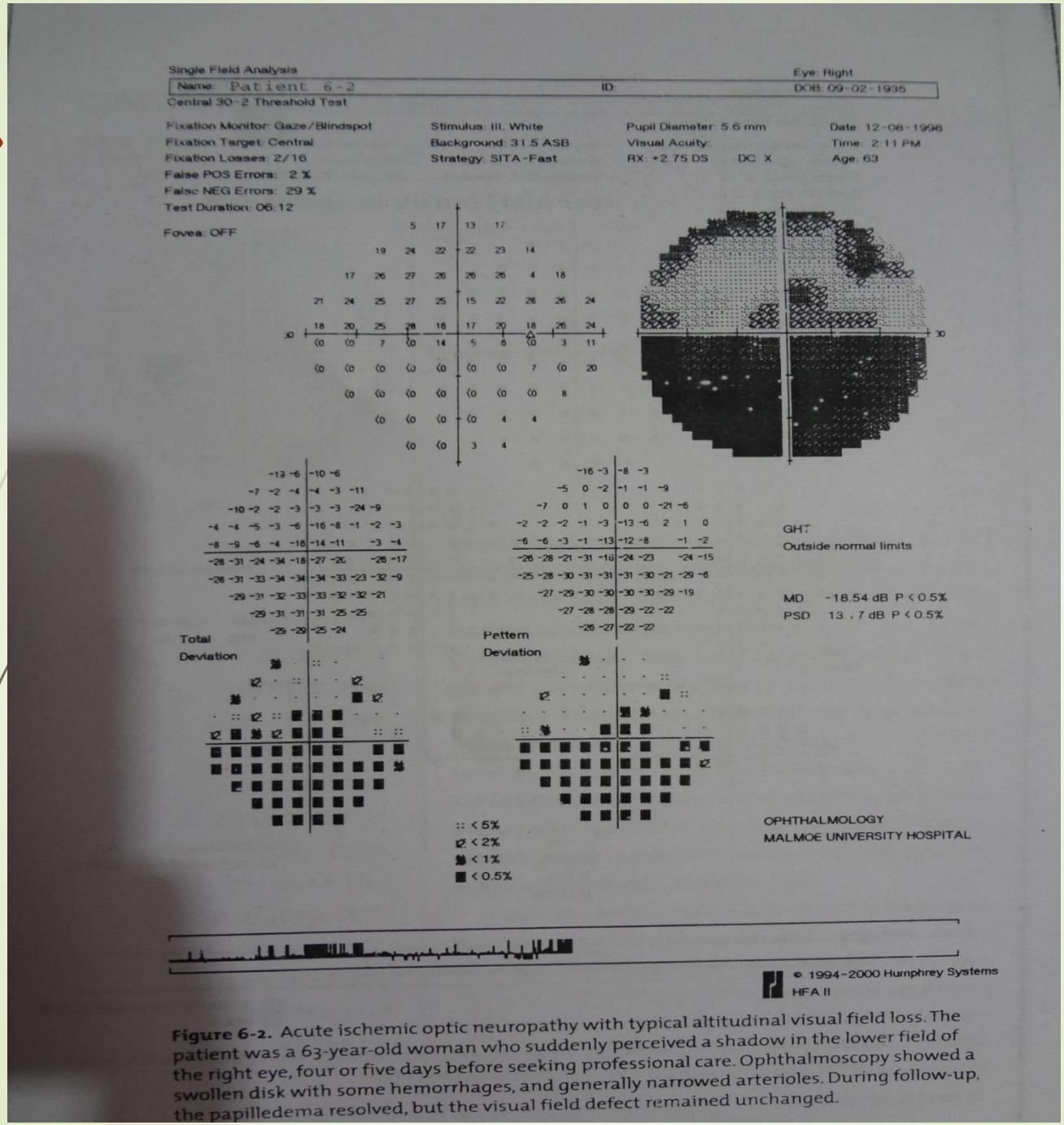



**Figure 6-2.** Acute ischemic optic neuropathy with typical altitudinal visual field loss. The patient was a 63-year-old woman who suddenly perceived a shadow in the lower field of the right eye, four or five days before seeking professional care. Ophthalmoscopy showed a swollen disk with some hemorrhages, and generally narrowed arterioles. During follow-up, the papilledema resolved, but the visual field defect remained unchanged.

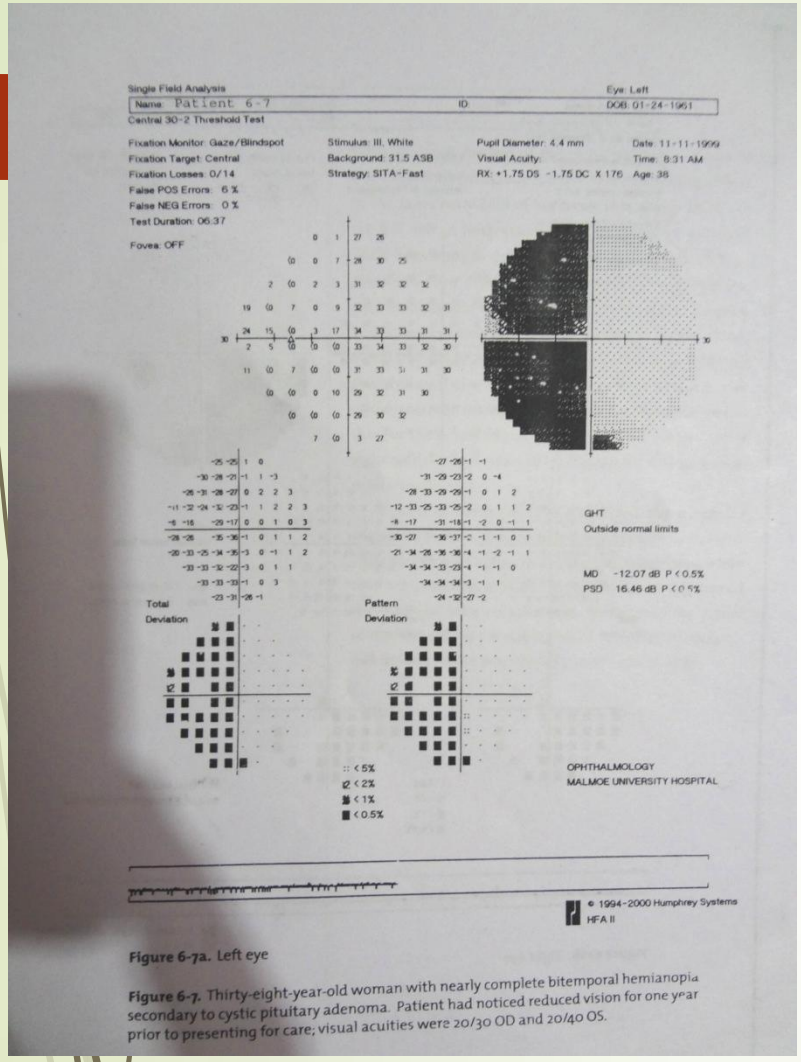



**Figure 6-7a.** Left eye

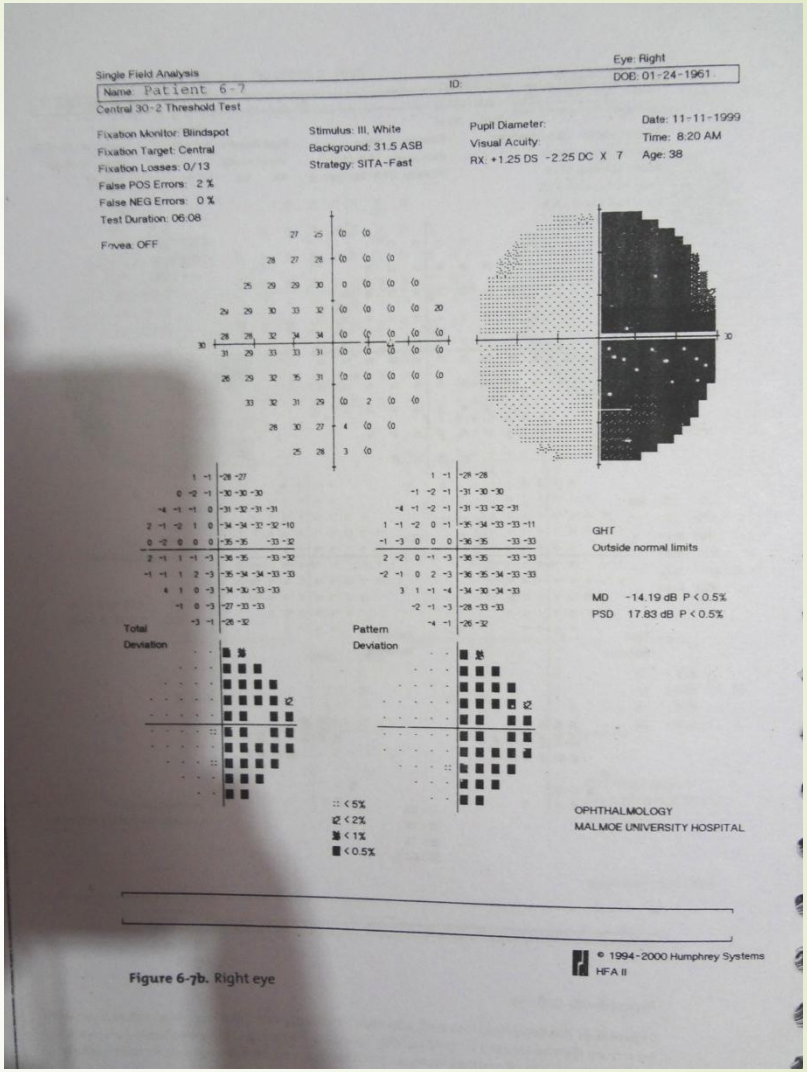



**Figure 6-7b.** Right eye

**Figure 6-7.** Thirty-eight-year-old woman with nearly complete bitemporal hemianopia secondary to cystic pituitary adenoma. Patient had noticed reduced vision for one year prior to presenting for care; visual acuities were 20/30 OD and 20/40 OS.

# Secondary to pituitary adenoma

# Short wavelength automated perimetry

- Blue on yellow perimetry
- Test is similar to conventional perimetry except blue stimuli is projected on a yellow background to isolate short wavelength-sensitive system
- Short wavelength-sensitive(blue) system is more sensitive to early glaucoma(mediated by blue cone receptors)
- Detects defects 3 yrs earlier than automated peimetry
- Limitations :

1. Limited availibility
2. Time consuming
3. Expensive

## Short-wave automated perimetry (SWAP)

- uses a blue(goldman stimulus V) stimulus on a bright(100cd/m2) yellow background
- Yellow background serves to reduce responsiveness of red and green cone system so that blue stimuli are seen primarily by blue cone system
- Sensitivity to blue light (mediated by blue cone photoreceptors) is adversely affected relatively early in glaucoma
- SWAP is more sensitive to early glaucomatous defects but has not been widely adopted because cataract decreases sensitivity to blue light (the brunescing lens acts as a yellow filter) and patients frequently dislike the lengthy test

# Frequency doubling perimeter

- Based on frequency doubling illusion
- Each test stimulus is a series of white and black bands flickering at 25 hz
- Higher detection rate for early glaucoma than with automated perimetry
- Relatively inexpensive, very short testing time and portable

*A stone is broken by the last stroke of hammer*

*This doesn't mean that the first stroke is useless*

*Success is the result of continuous effort*

Thank you !