

# VISUAL FIELDS

**Dr. Abdul Rawoof B**

**Consultant**

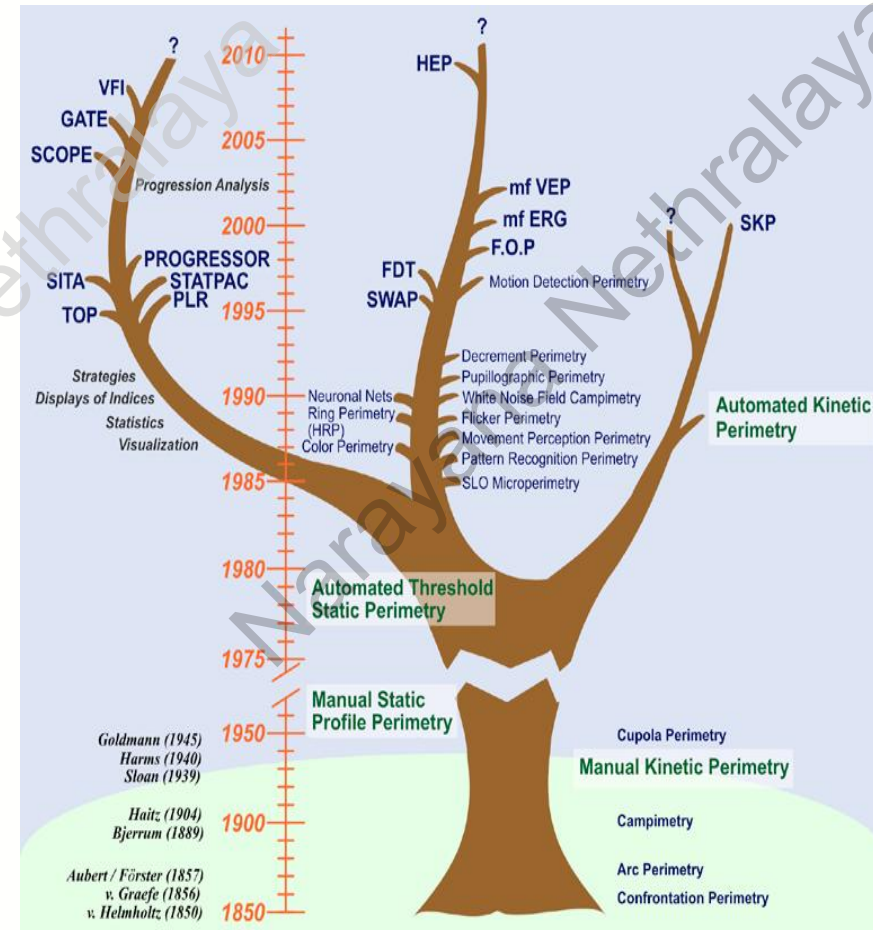
**Narayana Nethralaya**

**Bangalore**

# THE "PERIMETRIC FAMILY TREE" WITH METHODS FOR VISUAL FIELD TESTING.

Courtesy Springer Science-Conventional perimetry- U Schiefer et al. Der Ophthalmologe 2005 - 10 (6)

- FDT = Frequency Doubling Technology, FOP= Fundus oriented perimetry, GATE = German Adaptive Thresholding Estimation, HEP = Heidelberg Edge Perimeter, mfVEP = multi-focal Visually Evoked Potentials; mf-ERG = multi-focal Electroretinogram, PLR = pointwise linear regression, SCOPE = Scotoma oriented Perimetry, SITA = Swedish Interactive Thresholding Algorithm, SKP = semiautomated Kinetic Perimetry; SWAP = Short Wavelength Automated Perimetry; TOP = Tendency- Oriented Perimetry; VFI = Visual field index**



# VISUAL FIELDS IN NEURO OPHTHALMOLOGY

- **Visual pathway involved?**
- **Localizing the lesion based on the pattern of visual field defects.**
- **Visual fields helps to monitor resolution, recurrence and progression of conditions affecting the visual pathways.**
- **Follow up visual field helps in rehabilitation.**
- **Visual field deficits can occur either in isolation or in combination with other neurologic deficits.**
- **Patterns of VF defects aid in lesion localization, they are not pathognomonic for specific disease entities**

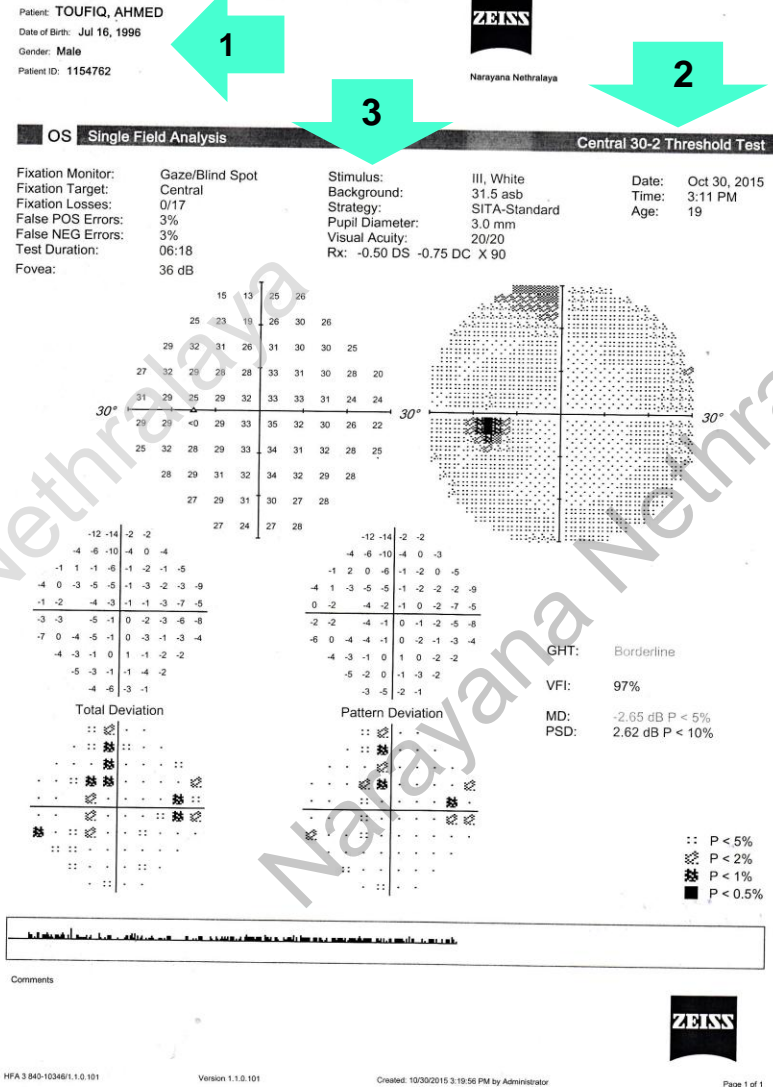
# VISUAL FIELDS

- Which test?
- Is the test accurate?
- Pattern of field defect.
- Compatible with pathology/disease.
- Normal or subnormal
- Review.

- Area tested  $24^{\circ}$ ,  $30^{\circ}$ ,  $60^{\circ}$ ,  $10^{\circ}$
- Threshold
- Screening
- Fast
- Threshold commonly used

# HFA

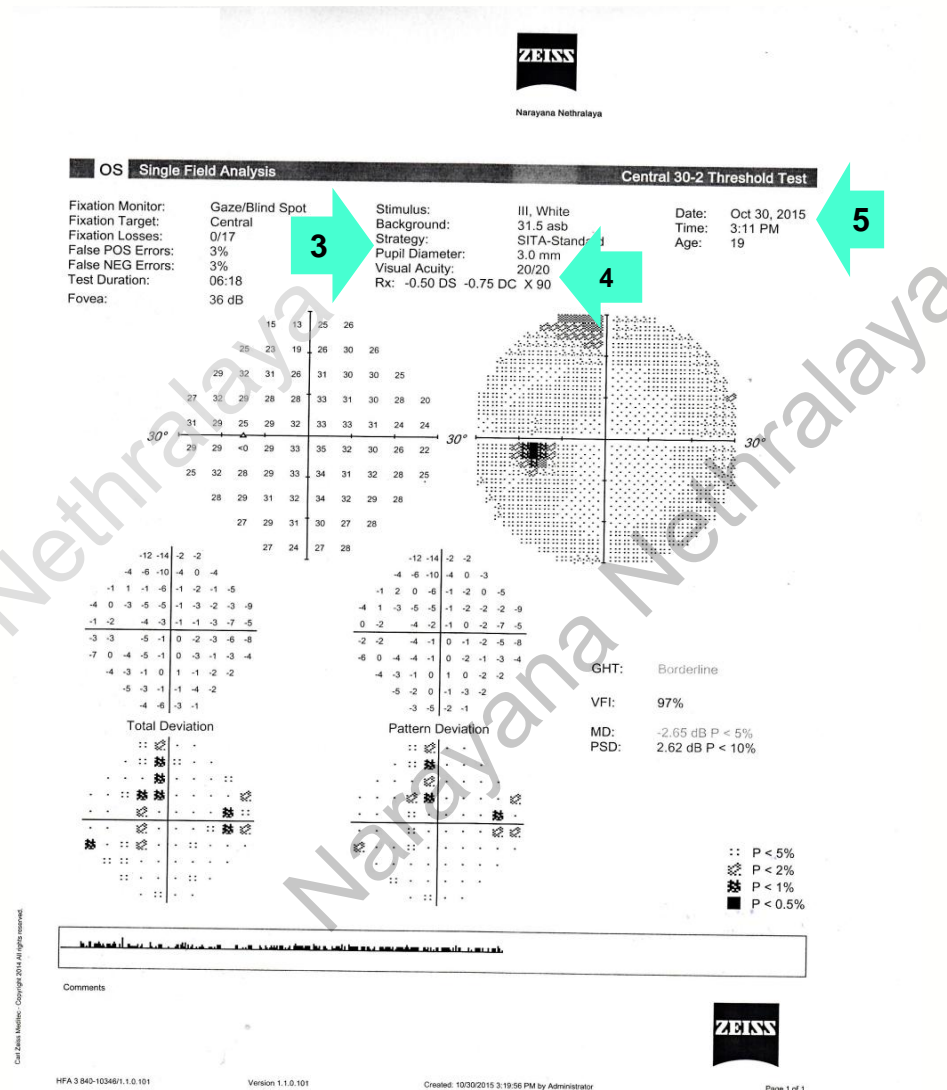
- 1. Confirm patient's name, ID number, and date of examination
- 2. Identify the testing algorithm (24-2, 30-2,) etc.
- 3. Confirm target size used. HVF target sizes range from 0.25 mm<sup>2</sup> to 64.00 mm<sup>2</sup> (Roman numerals I through V).
- Typically, a size III stimulus (4 mm<sup>2</sup>) is used.
- In cases of decreased visual acuity, a size V (64 mm<sup>2</sup>) target is used.





# HFA

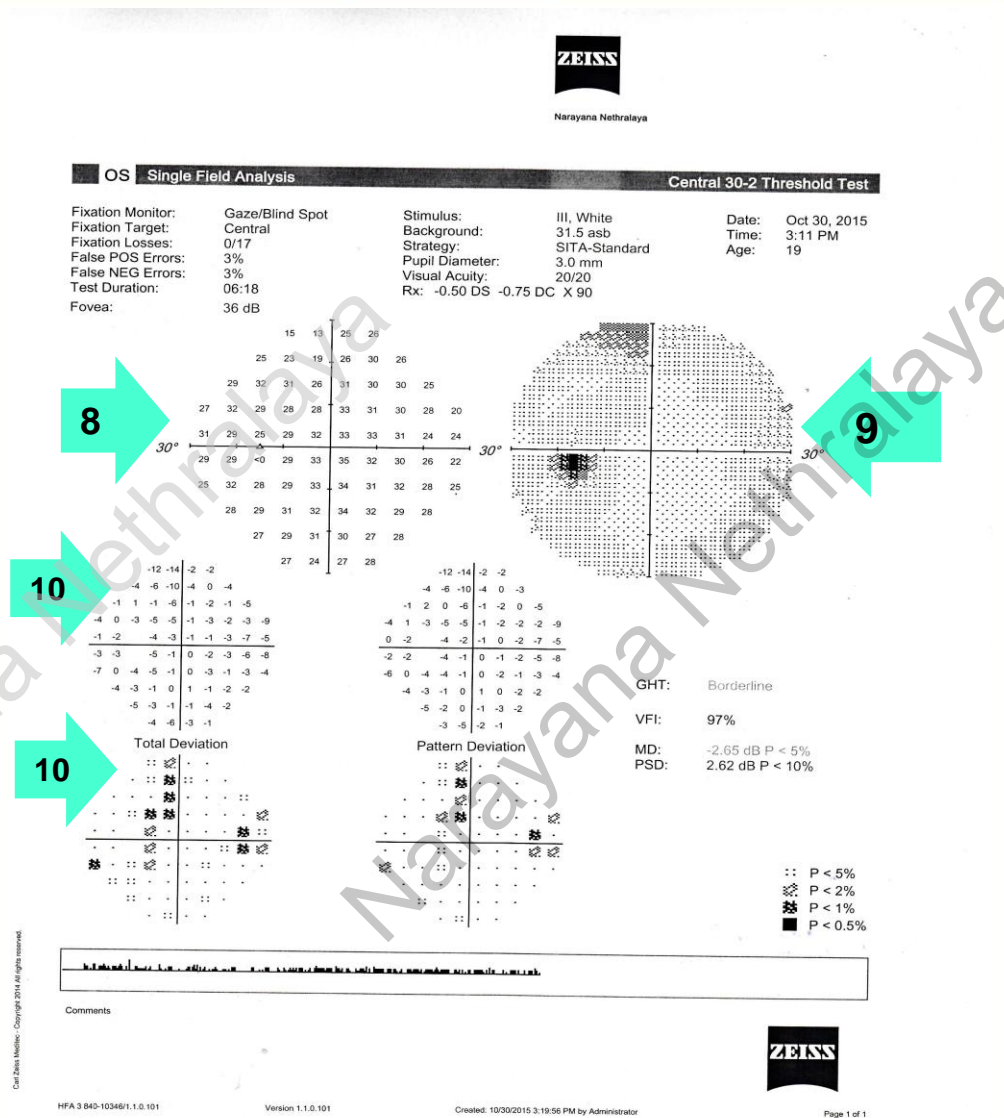
- 3. Pupil diameter at the time of testing. Pupils < 2 mm and > 6 mm may introduce artifacts due to light diffraction or induced aberrations
- 4. Astigmatism more than 1.25 D should be corrected in addition to the sphere adjustments.
- The date and time is noted. Patient's age is noted. Testing points for the HVF are compared with age matched controls in clusters of 10 years





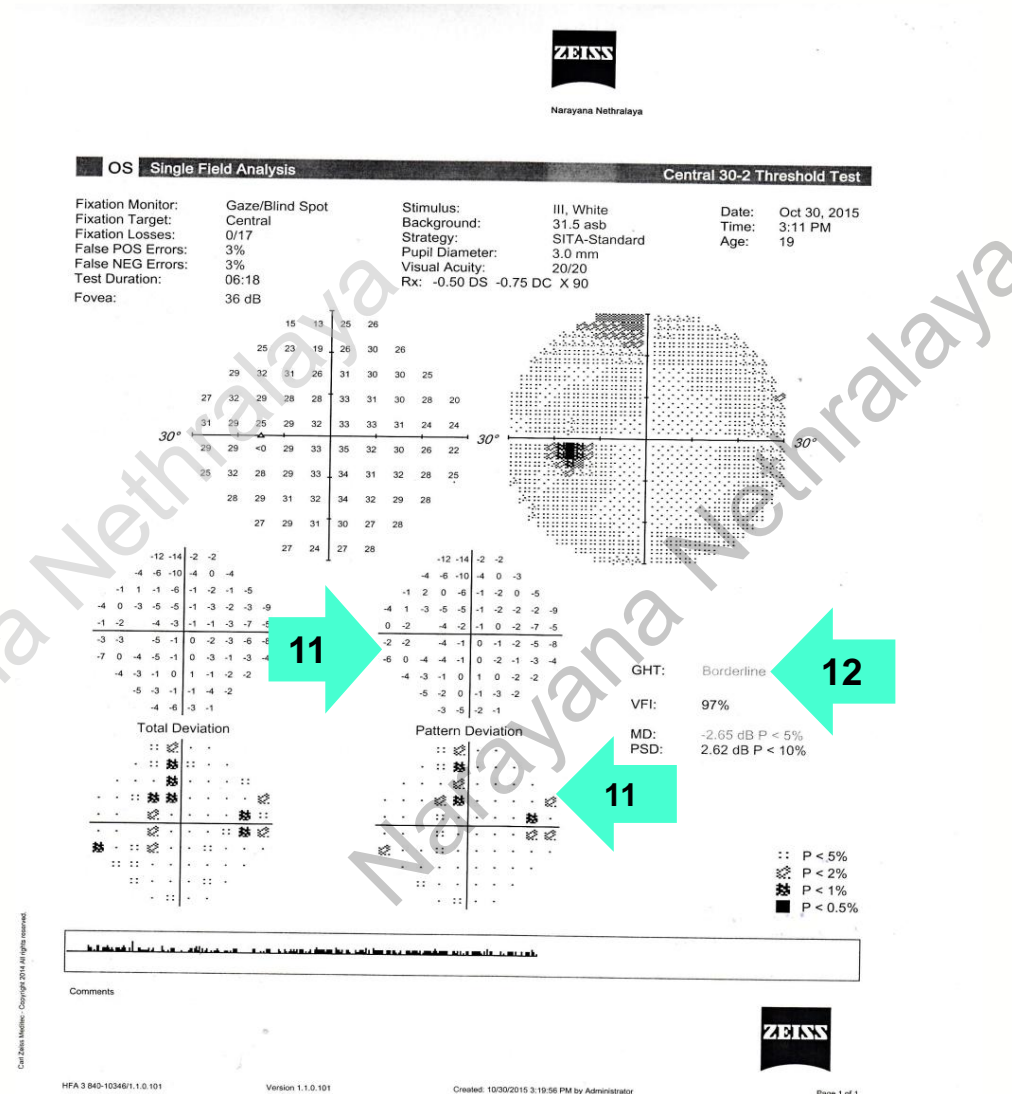
# HFA

- 8. The **numeric dB graph** is between 0 and 50 dB .
- 0 means the patient **could not see the brightest target**, and a **50** means the **dimmest target** was seen. Most values are around **30 dB**.
- 9. The **grayscale representation** - values closer to 0 dB with **black** and those closer to 50 dB with **white**.
- 10. The **mean deviation** is the **depressed vision** for each point when compared with **age matched controls**. It does not account for global depression from cataracts or vitreous hemorrhage.



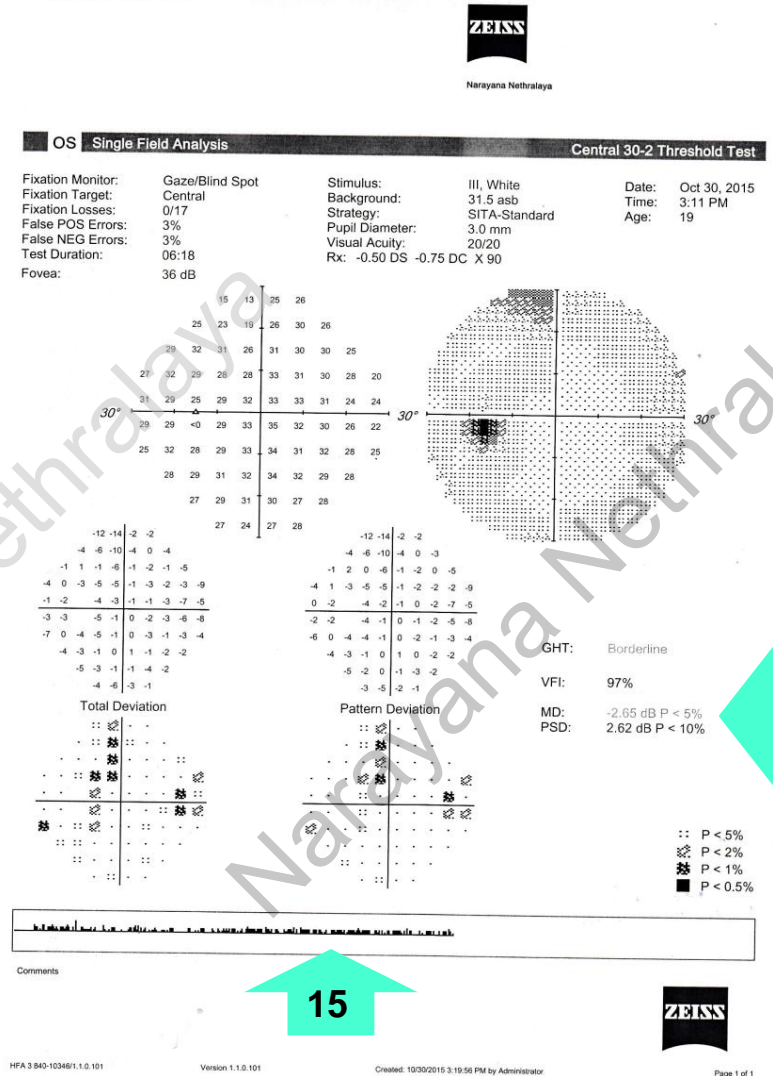
# HFA

- **11. Pattern deviation** represents focal depressed areas in the points tested .
- Accounts for any depression of the hill of vision that might be caused by media opacities.
- **12. The Glaucoma Hemifield Test** compares points in the upper field to corresponding points in the lower field
- (a) “outside normal limits” indicating the upper and lower fields are different; (b) borderline; (c) within normal limits; (d) abnormally high sensitivity; (e) general reduction in sensitivity.



# HFA

- **13. Pattern standard deviation (PSD) - A high PSD indicates a non uniform sensitivity loss (not from cataract or vitreous hemorrhage).**
- **14. Mean deviation (MD) is the average difference from normal in particular age group. Typically, an MD of -2.00 or less could indicate damage.**
- **15. The gaze tracker- upward fluctuations when the patient looks away from the target and downward fluctuations at times of eyelid closure**



# VISUAL FIELDS

- Look at fields of **both eyes** together
- The **left visual field** on the **left**, and the **right visual field** on the **right**.
- Is the data **trustworthy**?
- **Clustering of change** among adjacent data points
- Consider the fields with respect to **other clinical findings** such as bcva, color vision, pupils, optic disc and retinal features.
- Is the **history** also consistent?
- Must keep in mind **various causes** of field defects.
- Correlate with **neuroimaging** findings

## Patterns of Visual Field Loss

## Classic Location of Defect

Generalized decrease in sensitivity

Media opacity (cornea, lens, or vitreous), decreased attention

Constriction of the visual field

Retina, optic nerve, small pupils

Ring scotoma

Retina degeneration

Central scotoma

Macula or optic nerve

Cecocentral scotoma

Papillomacular nerve bundle in region between the macula and optic nerve head

Arcuate scotoma

Arcuate retinal nerve fiber bundles or retinal vasculature

Temporal wedge

Nasal retina fibers entering the optic nerve

**Blind spot enlargement**

**Optic nerve**

**Multiple scattered defects**

**Retina**

**Hemifields respecting the horizontal meridian**

**Retinal nerve fiber bundles or less commonly retinal vasculature**

**Hemifields respecting the vertical meridian**

**Optic chiasm or posterior visual pathways**

**Bitemporal**

**Optic chiasm**

**Homonymous**

**Optic tract or optic radiations**

**Horizontal tongue**

**Lateral geniculate body**

**Incongruous bilateral defects**

**Optic radiation**

# PATTERN OF VISUAL FIELD LOSS AND LOCATION OF DEFECTS

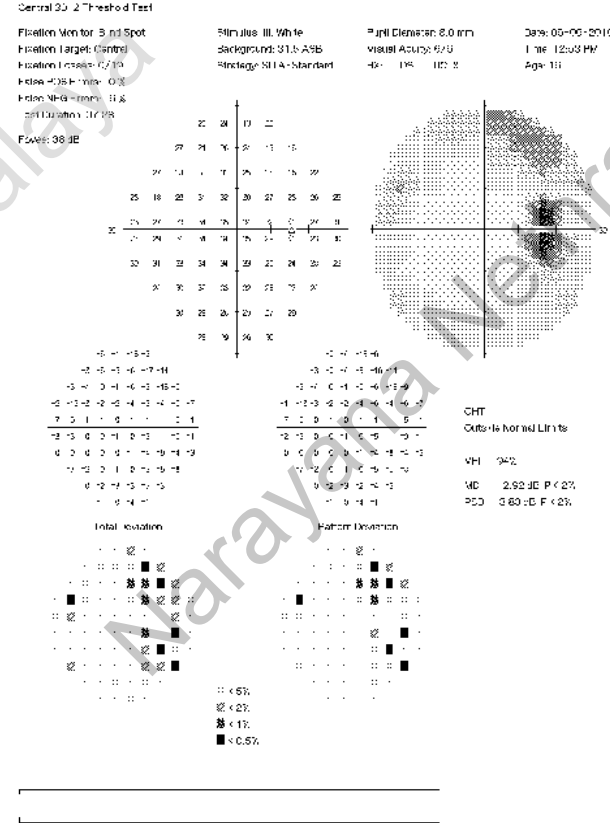
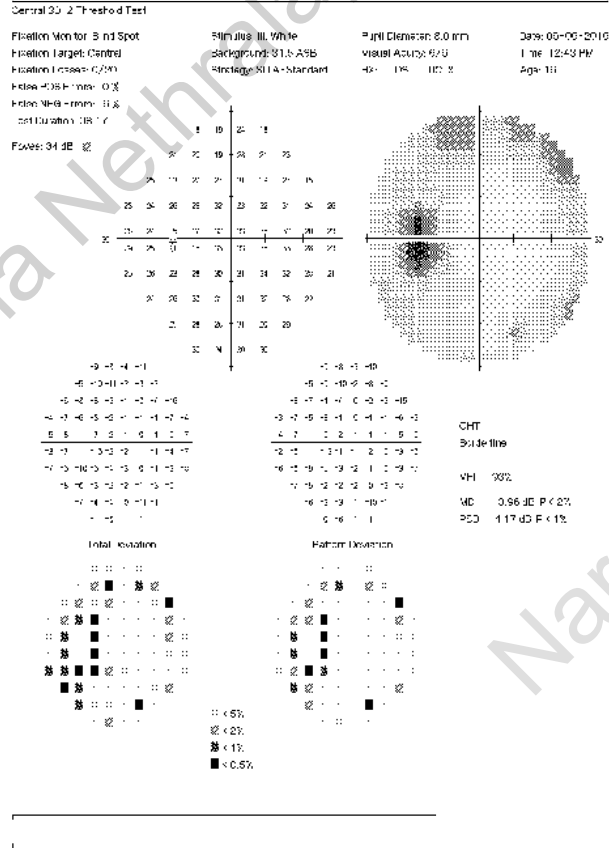
<b>Congruous bilateral defects</b>	<b>Nearer to the posterior visual cortex</b>
<b>"Pie in the sky"</b>	<b>Temporal lobe</b>
<b>"Pie on the floor"</b>	<b>Parietal lobe</b>
<b>"Punched out" defects</b>	<b>Occipital lobe</b>

# CAN WE COMPARE?

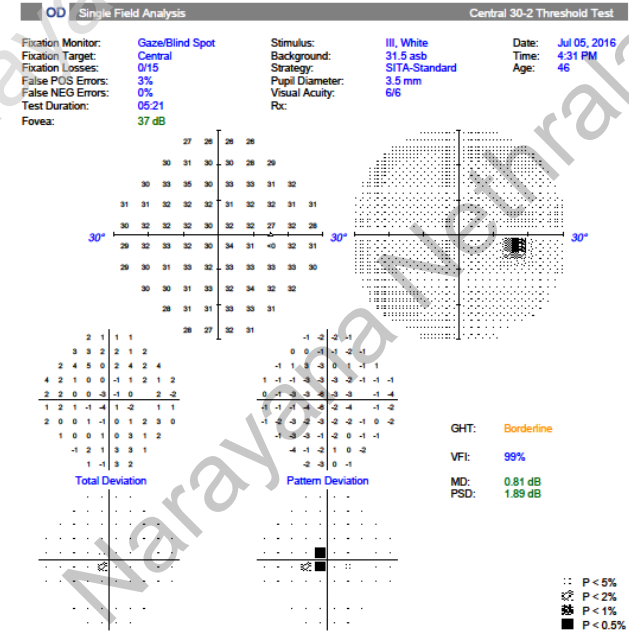
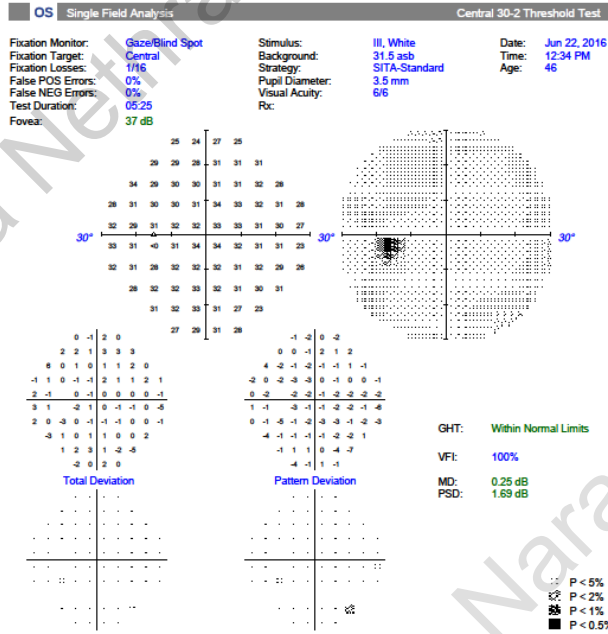
- **Cannot compare** printout of different machines e.g. Humphrey and Octopus because
- **The test locations** are not the same
- **The decibel values** used by different manufacturers may not be comparable owing to differences in background luminance and test object intensity.



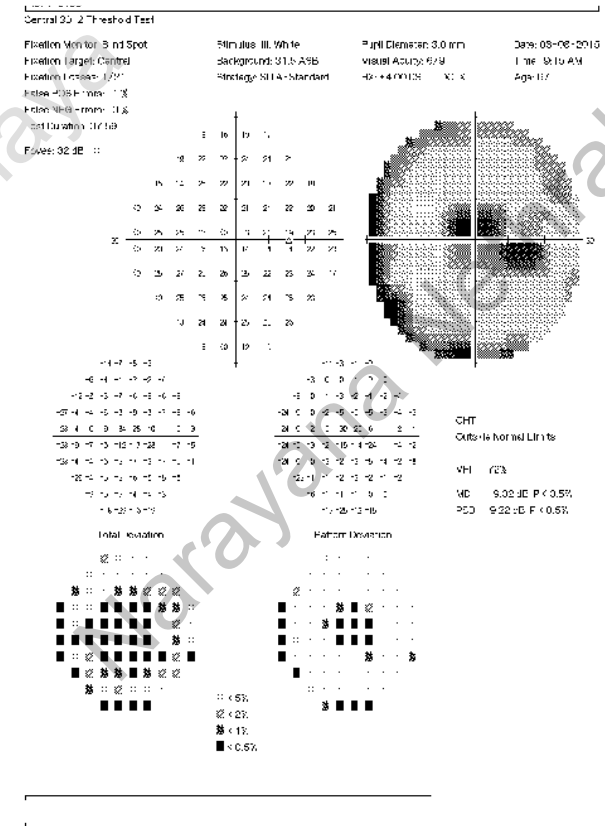
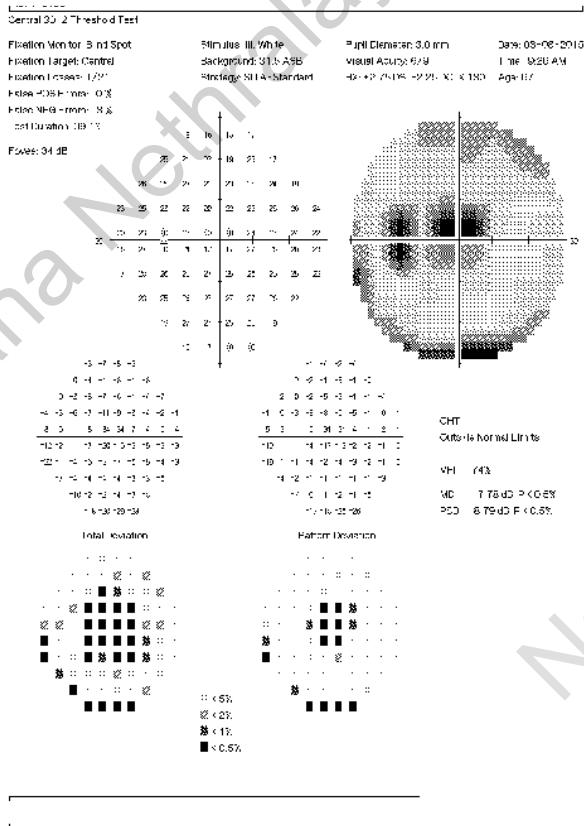
# ENLARGED BLIND SPOT WITH PAPILLEDEMA



# CENTRAL SCOTOMA IN RE (IN MS)



# CENTRO CECAL SCOTOMA IN BOTH EYES IN NUTRITIONAL OPTIC NEUROPATHY





# FEW WEEKS AFTER TREATMENT

## Central 30-2 Threshold Test

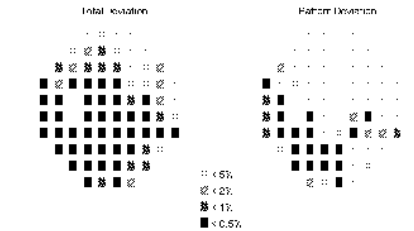
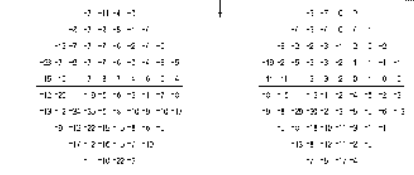
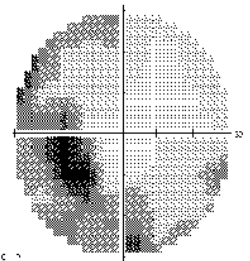
Fixation Monitor: 3 rd Spot  
 Fixation Target: Central  
 Fixation Losses: 0/27  
 Fixate < 0.5% - mean: 13.5%  
 Post Duration: 13.0%

Stimulus III: White  
 Background: S11.5-ASB  
 Background: S11.4-Standard

Pupil Diameter: 3.0 mm  
 Visual Acuity: 6/9

Date: 23-12-2013  
 Time: 4:47 PM  
 Age: 34

Fixes: 28 JE



## Central 30-2 Threshold Test

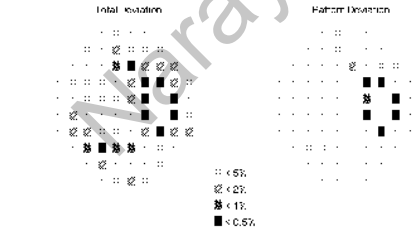
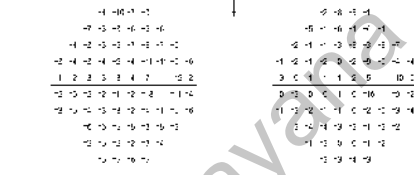
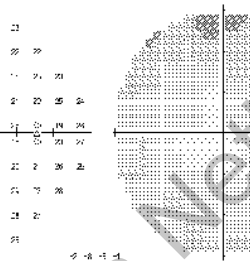
Fixation Monitor: 3 rd Spot  
 Fixation Target: Central  
 Fixation Losses: 0/27  
 Fixate < 0.5% - mean: 13.5%  
 Post Duration: 13.4%

Stimulus III: White  
 Background: S11.5-ASB  
 Background: S11.4-Standard

Pupil Diameter: 3.0 mm  
 Visual Acuity: 6/9

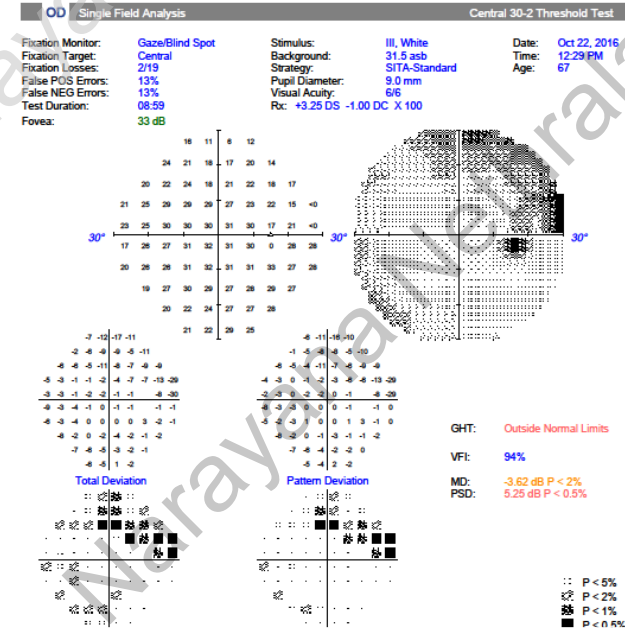
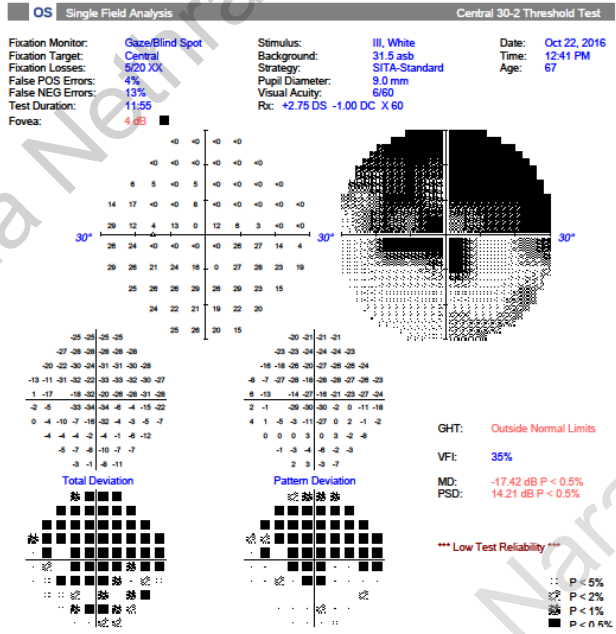
Date: 23-12-2013  
 Time: 4:38 PM  
 Age: 34

Fixes: 33 JE

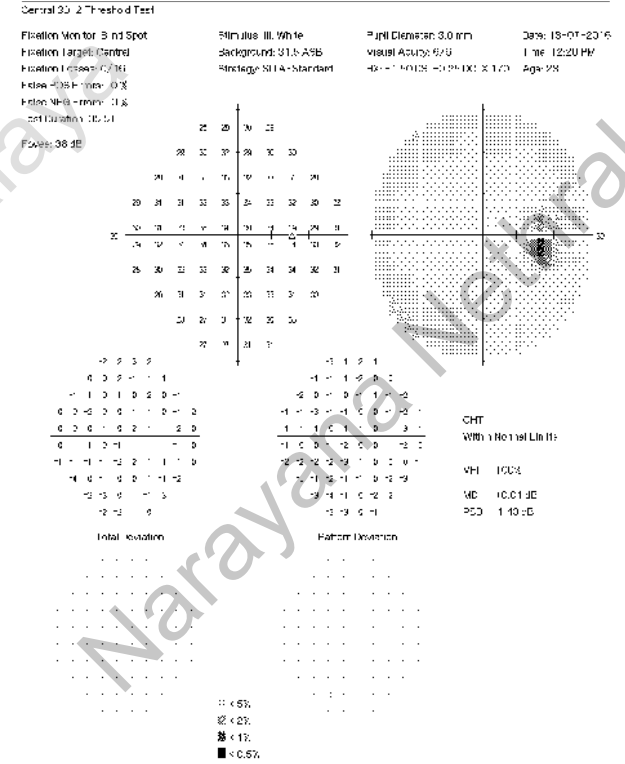
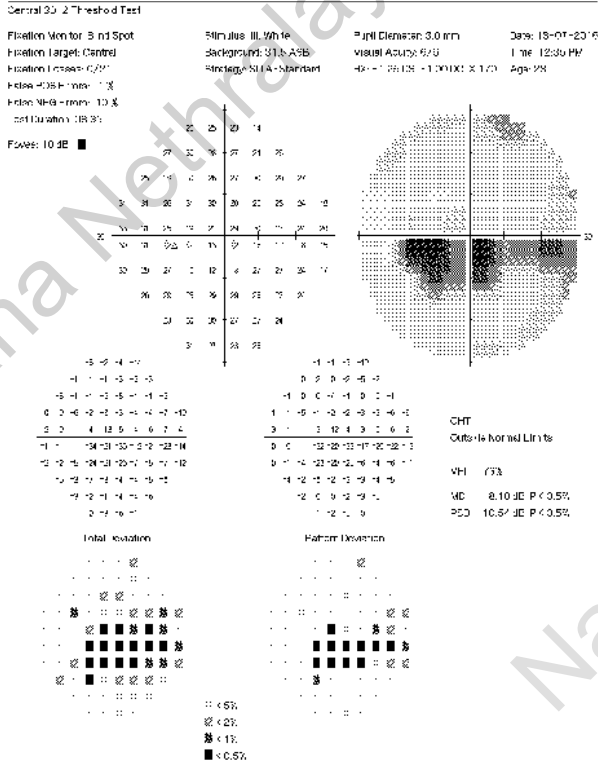


TRN 01/2013/0402/01/13

# PAPILLITIS LE



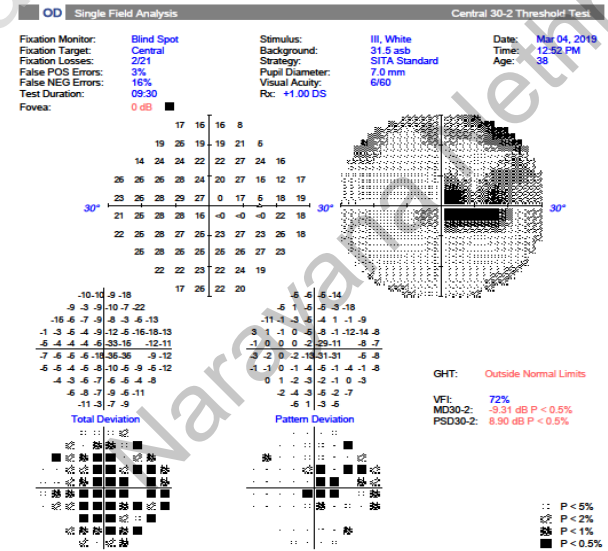
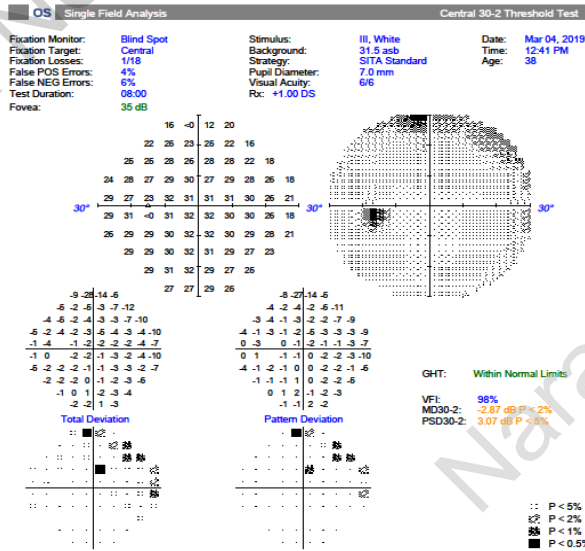
# PAPILLITIS LE



# RE-RETROBULBAR NEURITIS

LE

RE



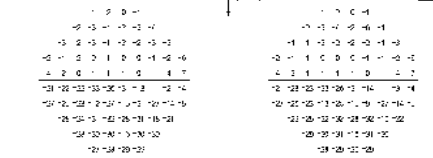
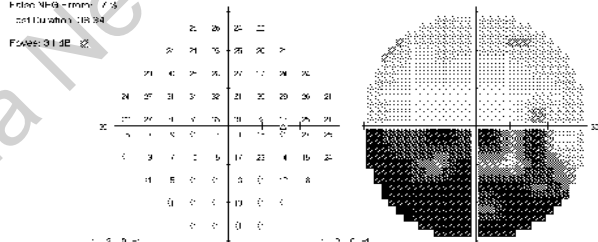
# INFERIOR ALTITUDINAL DEFECT IN BILATERAL NAAION

Single Field Analysis  
 Name: PESAVA RAO KAHENDRA GAR  
 ID: 242040  
 Central 20-2 Threshold Test  
 Eye: Right  
 DOB: 02-09-1952

Fixation Monitor: 3 rd Spot  
 Fixation Target: Central  
 Fixation Losses: 2/291  
 Fixation Time: 100%  
 Fixation Time: 100%  
 Central 20-2 Threshold Test

Stimulus III: White  
 Background: 31.5 ASB  
 Pretestage: 31.4 - Standard  
 Right Elevation: 5.0 mm  
 Visual Acuity: 6/9  
 Age: 49

Date: 15-03-2016  
 Time: 9:53 PM  
 Age: 49



CHT  
 Cuts-In Normal Limits

VH: 612  
 MD: 10.09 dB P < 0.5%  
 PSD: 17.85 dB P < 0.5%

NARAYANA NETHRALAYA  
 SUPER SPECIALITY EYE HOSPITAL  
 151/C, CHICHO ROAD, RAJAJINAGAR, 1ST FLOOR  
 BANGALORE-10 749150-9512100-1102

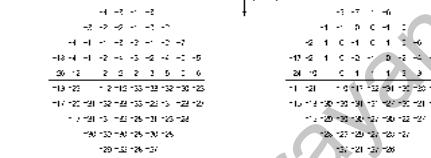
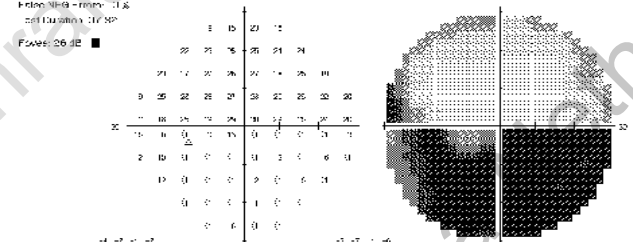
© 2006 Zeiss Meditec  
 HFA II 720-5975-5 0/5.0

Single Field Analysis  
 Name: PESAVA RAO KAHENDRA GAR  
 ID: 242040  
 Central 20-2 Threshold Test  
 Eye: Left  
 DOB: 02-09-1952

Fixation Monitor: 3 rd Spot  
 Fixation Target: Central  
 Fixation Losses: 0/14  
 Fixation Time: 100%  
 Fixation Time: 100%  
 Central 20-2 Threshold Test

Stimulus III: White  
 Background: 31.5 ASB  
 Pretestage: 31.4 - Standard  
 Right Elevation: 5.0 mm  
 Visual Acuity: 6/18  
 Age: 49

Date: 15-03-2016  
 Time: 4:00 PM  
 Age: 49



CHT  
 Cuts-In Normal Limits

VH: 562  
 MD: 17.17 dB P < 0.5%  
 PSD: 18.27 dB P < 0.5%

NARAYANA NETHRALAYA  
 SUPER SPECIALITY EYE HOSPITAL  
 151/C, CHICHO ROAD, RAJAJINAGAR, 1ST FLOOR  
 BANGALORE-10 749150-9512100-1102

© 2006 Zeiss Meditec  
 HFA II 720-5975-5 0/5.0

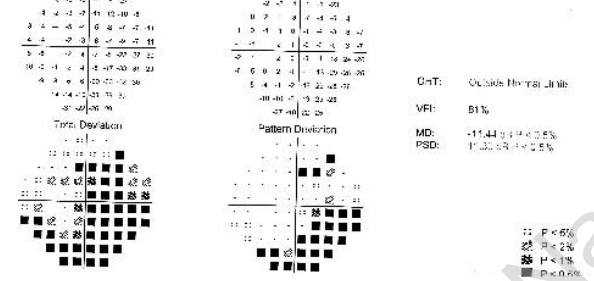
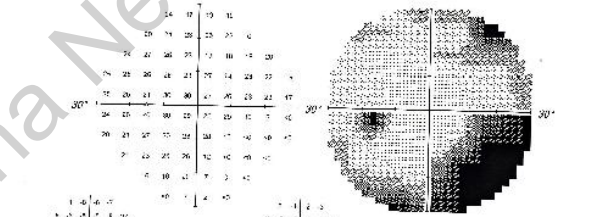
# LE NAAION-INFERO NASAL DEFECT

## OS Single Field Analysis Central 30-2 Threshold Test

Fixation Monitor: On  
 Fixation Target: Central  
 Fixation Losses: 27%  
 False POS Errors: 0%  
 False NEG Errors: 7%  
 Test Duration: 07:54  
 Eyes: OD OS

Stimulus: LL W-1a  
 Background: 21.5 arc  
 Strategy: SITA Standard  
 Pup. Diameter: 6.0 mm  
 Visual Acuity: 20/32  
 Rx: +3.75 DS 0.75 DC X-10

Date: Oct 09, 2015  
 Time: 1:20 PM  
 Age: 49

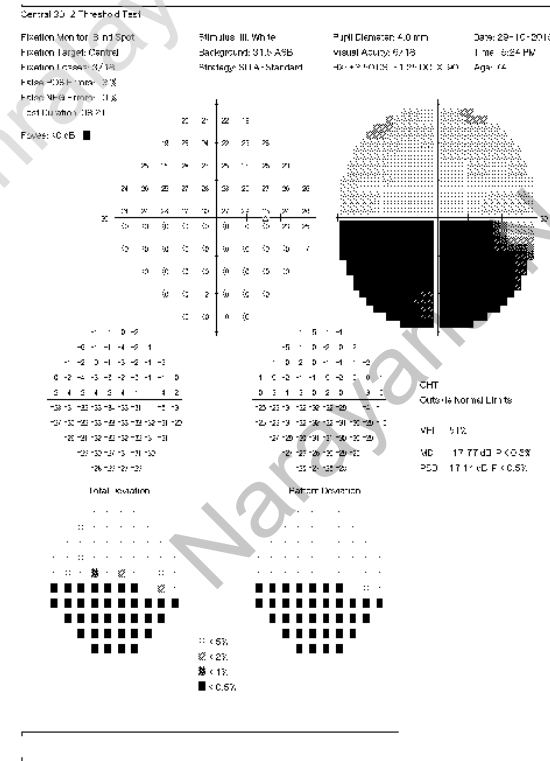
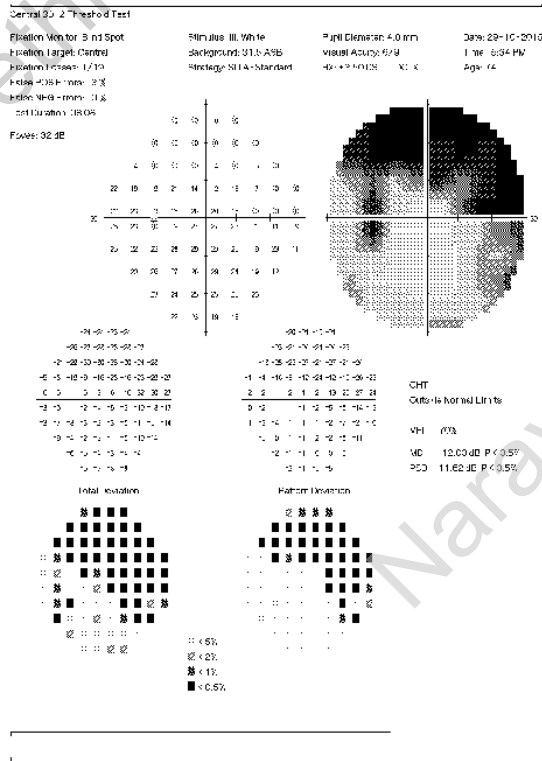




# SEQUENTIAL NAAION; LE on 29-10-15

## LE

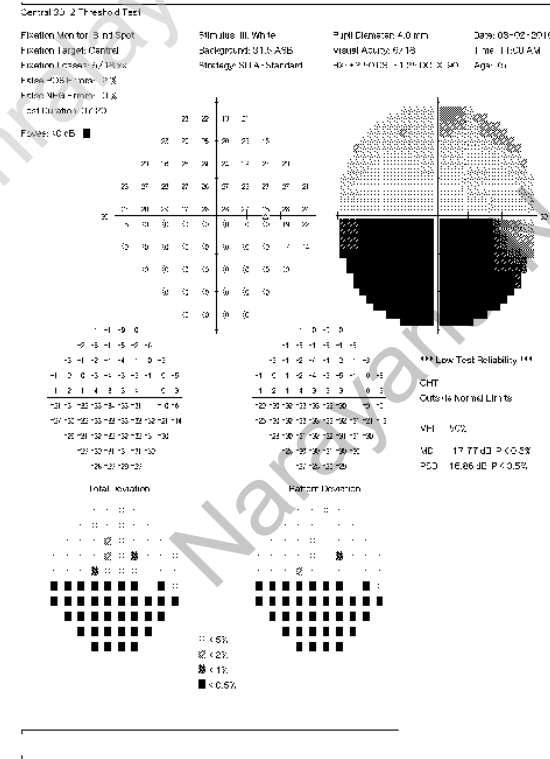
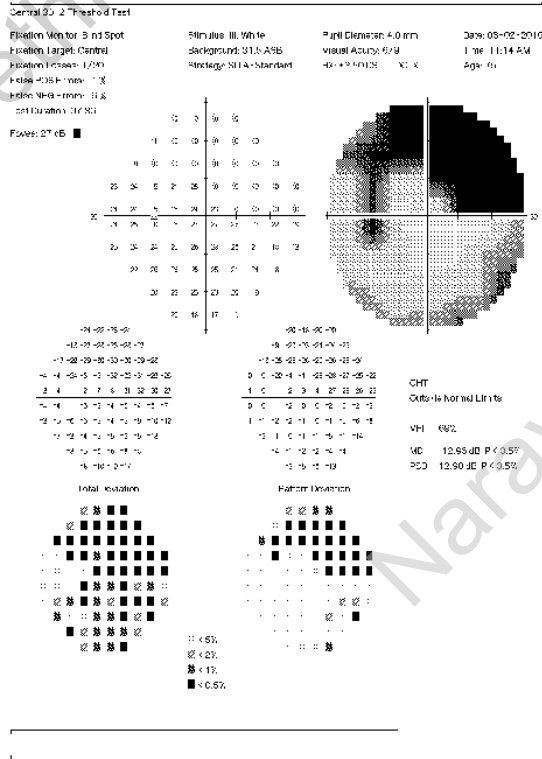
## RE



# LE on 8-2-16

## LE

## RE



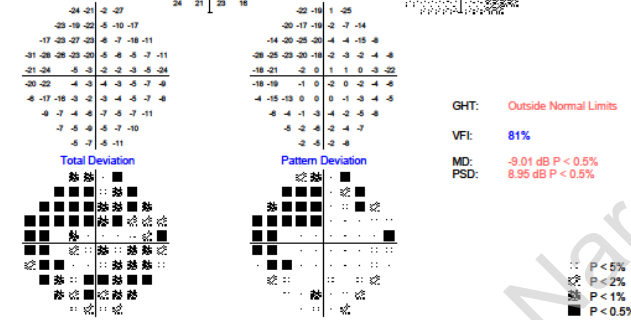
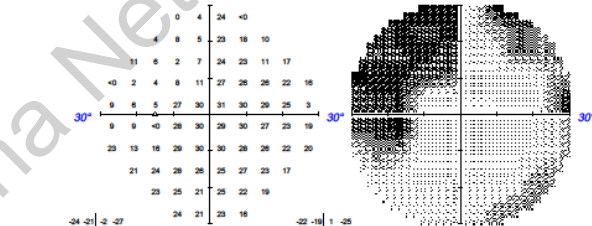
# MYELINATED NERVE FIBRES

## OS Single Field Analysis Central 30-2 Threshold Test

Fixation Monitor: Gaze/Blind Spot  
 Fixation Target: Central  
 Fixation Losses: 0/23  
 False POS Errors: 5%  
 False NEG Errors: 8%  
 Test Duration: 08:41  
 Fovea: 35 dB

Stimulus: Ill, White  
 Background: 31.5 asb  
 Strategy: SITA-Standard  
 Pupil Diameter: 3.0 mm  
 Visual Acuity: 6/6  
 Rc: +1.00 DS

Date: Jun 11, 2016  
 Time: 3:40 PM  
 Age: 47

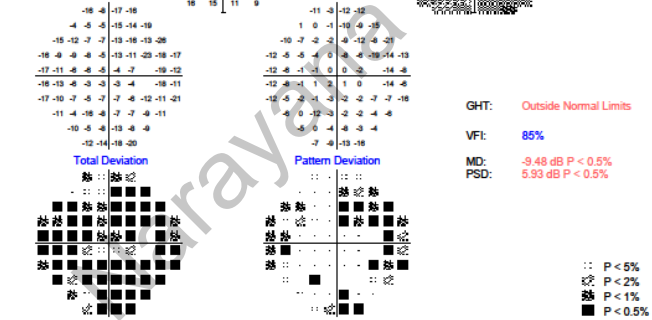
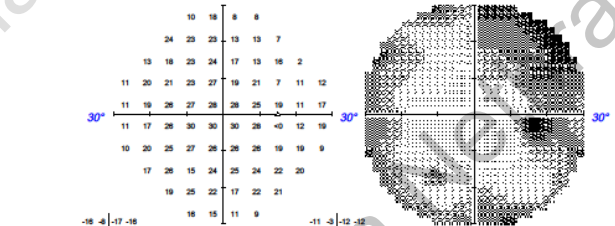


## OD Single Field Analysis Central 30-2 Threshold Test

Fixation Monitor: Gaze/Blind Spot  
 Fixation Target: Central  
 Fixation Losses: 0/22  
 False POS Errors: 0%  
 False NEG Errors: 7%  
 Test Duration: 10:20  
 Fovea: 33 dB

Stimulus: Ill, White  
 Background: 31.5 asb  
 Strategy: SITA-Standard  
 Pupil Diameter: 3.0 mm  
 Visual Acuity: 6/6  
 Rc: +0.75 DS -1.00 DC X 125

Date: Jun 11, 2016  
 Time: 3:28 PM  
 Age: 47



# SUPERIOR ARCUATE LE

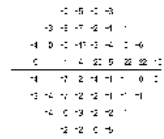
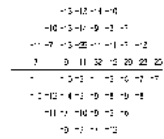
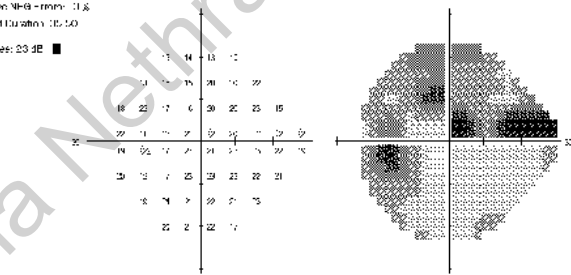
## Central 24 - 2 Threshold Test

Fixation Monitor: 3 rd Spot  
 Fixation Target: Central  
 Fixation Losses: 0/14  
 Fixation Losses - min: 0%  
 Fixation NHG - min: 0.0  
 Test Duration: 10:50  
 Fixation: 20 JE

Stimulus III, White  
 Background: 31.5 ASEB  
 Background: N14 - Standard

Pupil Diameter: 6.0 mm  
 Visual Acuity: 6/30  
 Age: 42 Y 10 M 28 D

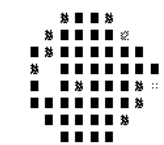
Date: 05-06-2016  
 Time: 10:44 AM  
 Age: 18?



CHT  
 Optic Nerve Head  
 VHI: 63%  
 MD: 11.57 dB F < 0.5%  
 PSD: 6.67 dB F < 0.5%

Total Deviation

Pattern Deviation



□ < 5%  
 □ < 2%  
 □ < 1%  
 ■ < 0.5%

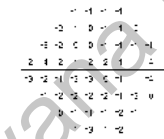
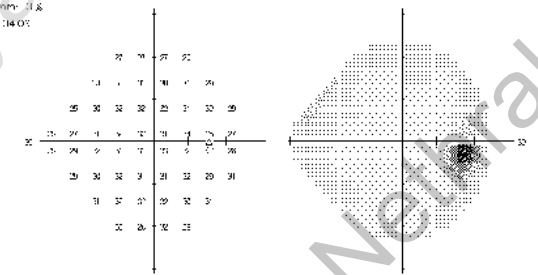
## Central 24 - 2 Threshold Test

Fixation Monitor: 3 rd Spot  
 Fixation Target: Central  
 Fixation Losses: 0/14  
 Fixation Losses - min: 0%  
 Fixation NHG - min: 0.0  
 Test Duration: 10:50  
 Fixation: 08 JE

Stimulus III, White  
 Background: 31.5 ASEB  
 Background: N14 - Standard

Pupil Diameter: 6.0 mm  
 Visual Acuity: 6/30  
 Age: 42 Y 10 M 28 D

Date: 05-06-2016  
 Time: 10:49 AM  
 Age: 18?



CHT  
 With Horizontal Lines  
 VHI: 100%  
 MD: 10.06 JE  
 PSD: 1.96 dB

Total Deviation

Pattern Deviation

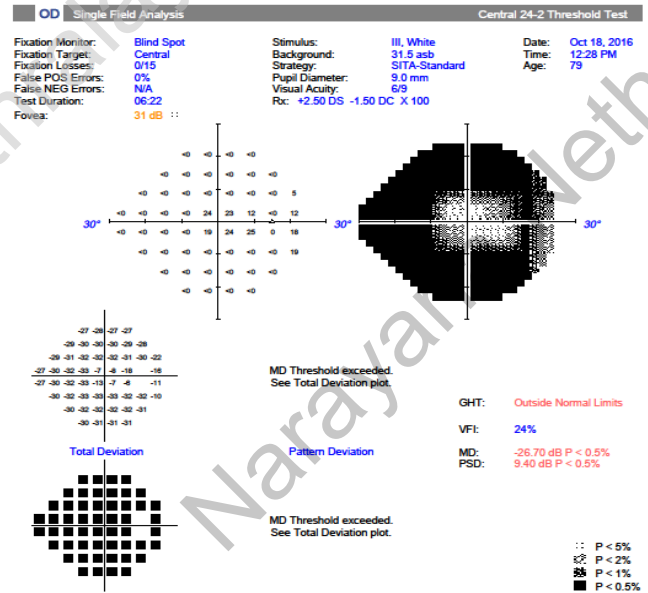
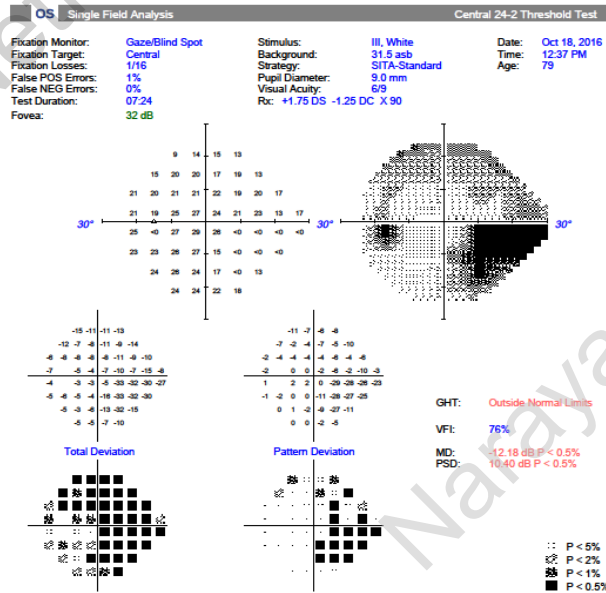


□ < 5%  
 □ < 2%  
 □ < 1%  
 ■ < 0.5%

# GLAUCOMA

## INF.NASAL

## RING SCOTOMA



# INCONGRUOUS LEFT HOMONYMOUS HEMIANOPIA - GIANT RT. TEMPORAL AVM

Central 20-2 Threshold Test

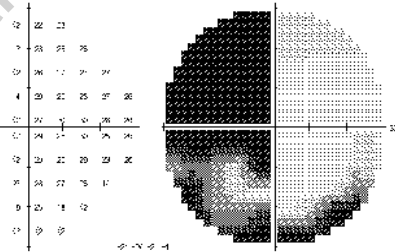
Fixation Monitor: 5 (1) Spot  
 Fixation Target: Central  
 Fixation Crosses: 7/10  
 Field Size: 11.5 x 11.5  
 Field Size - mm: 14.5  
 Contrast: 18.0%

Stimulus III, White  
 Background: 31.5 A/B  
 Strategy: 31.4 - Standard

Light Diameter: 3.0 mm  
 Visual Acuity: 5/9  
 Age: 11

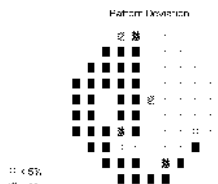
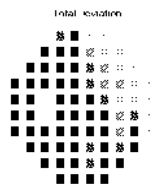
Date: 28-10-2010  
 Time: 11:24 AM

Fixation: 00 dB



20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35

CHT  
 Cuts-Is Normal Limits  
 VFI: 58%  
 MD: 15.59 dB P < 0.5%  
 PSD: 17.70 dB P < 0.5%



Legend:  
 ○: < 5%  
 ○: < 2%  
 ○: < 1%  
 ■: < 0.5%

Central 20-2 Threshold Test

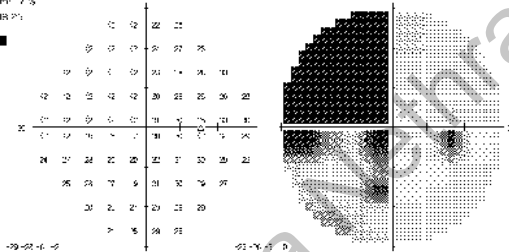
Fixation Monitor: 5 (1) Spot  
 Fixation Target: Central  
 Fixation Crosses: 7/10  
 Field Size: 11.5 x 11.5  
 Field Size - mm: 14.5  
 Contrast: 18.0%

Stimulus III, White  
 Background: 31.5 A/B  
 Strategy: 31.4 - Standard

Light Diameter: 3.0 mm  
 Visual Acuity: 5/9  
 Age: 11

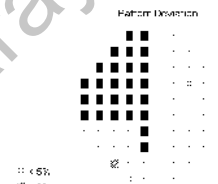
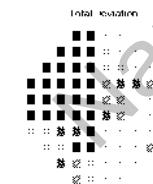
Date: 28-10-2010  
 Time: 12:44 PM

Fixation: 00 dB



20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35

CHT  
 Cuts-Is Normal Limits  
 VFI: 61%  
 MD: 10.40 dB P < 0.5%  
 PSD: 15.00 dB P < 0.5%

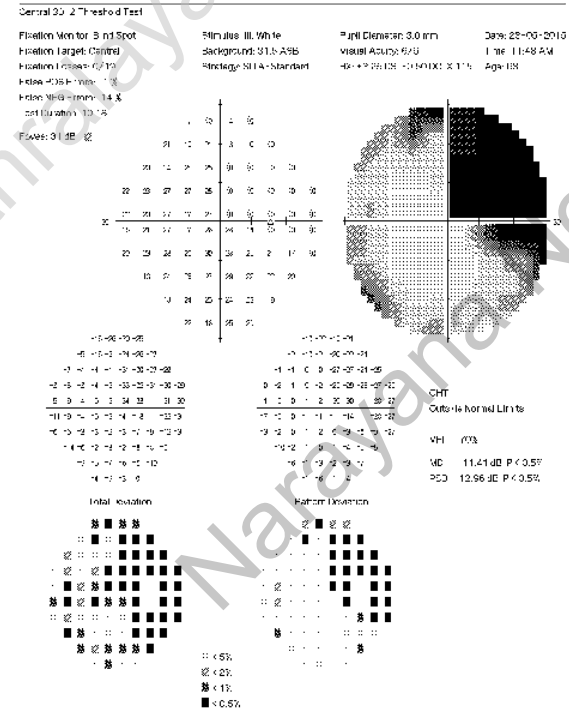
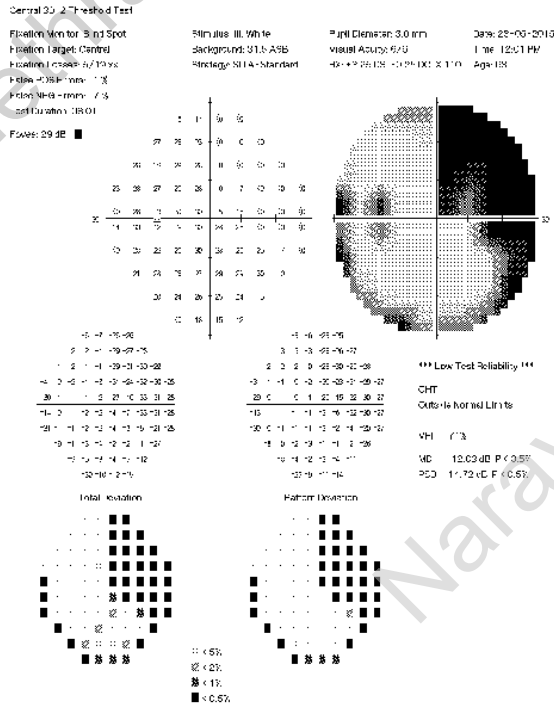


Legend:  
 ○: < 5%  
 ○: < 2%  
 ○: < 1%  
 ■: < 0.5%

# INCONGRUOUS RIGHT HOMONYMOUS HEMIANOPIA

## LE

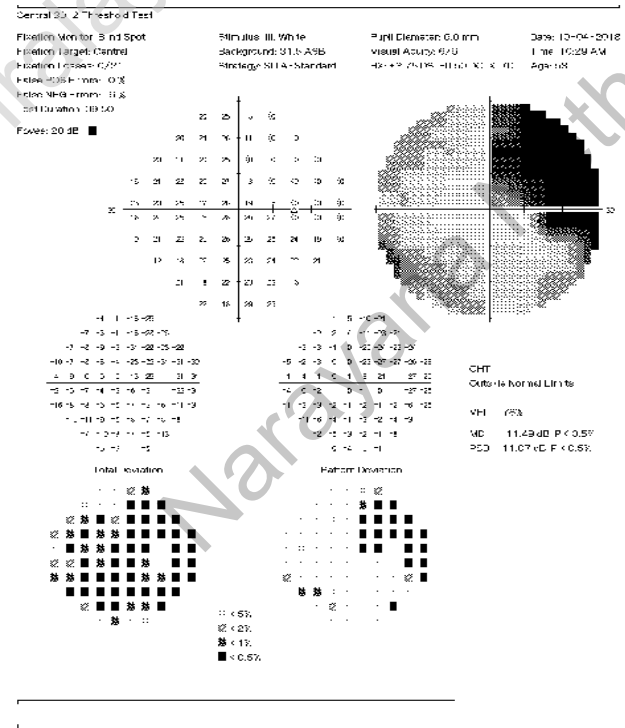
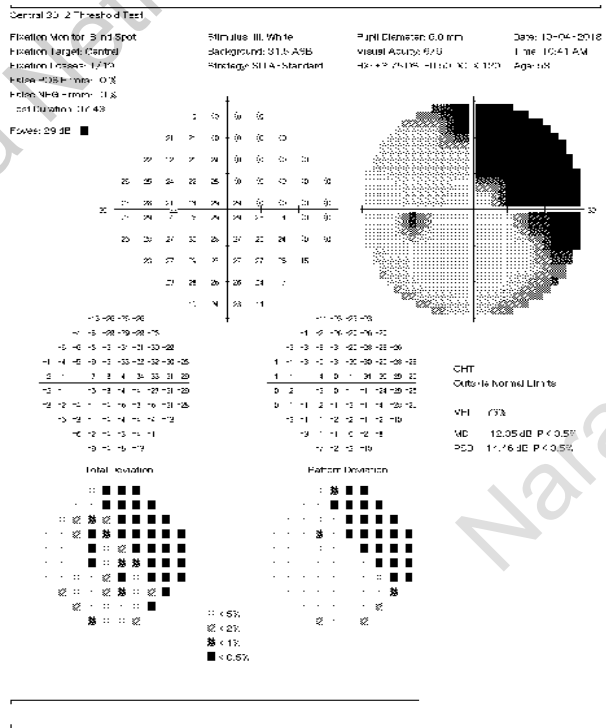
## RE



# INCONGRUOUS RIGHT HOMONYMOUS HEMIANOPIA

LE

RE



# LEFT HOMONYMOUS HEMIANOPIA

Central 30-2 Threshold Test

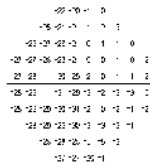
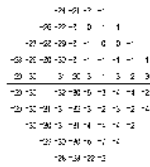
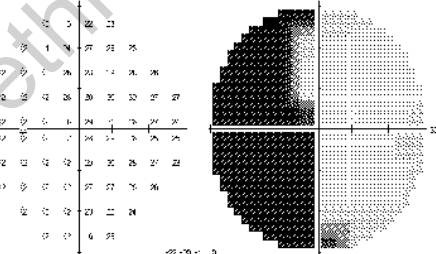
Fixation Monitor: 3 rd Spot  
 Fixation Target: Central  
 Fixation Losses: 0/17  
 Fixation Losses - mean: 0.0%  
 Fixation NFI - mean: 0.0%  
 Test Duration: 11/25

Stimulus III, White  
 Background: 31.5 AFB  
 Strategy: N14 - Standard

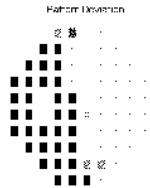
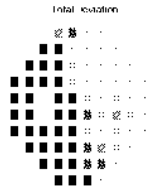
Pupil Diameter: 3.0 mm  
 Visual Acuity: 6/9  
 40 + 2 MDSI -13 MDSI X NFI

Date: 09-11-2016  
 Time: 2:41 PM  
 Age: 67

Flows: 34 dB



CHT  
 Cuts-to-Normal Limits  
 VFI: 50%  
 MD: 13.61 dB P < 0.5%  
 PSD: 15.79 dB P < 0.5%



Central 30-2 Threshold Test

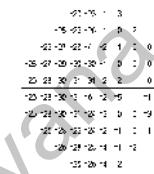
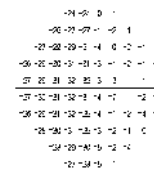
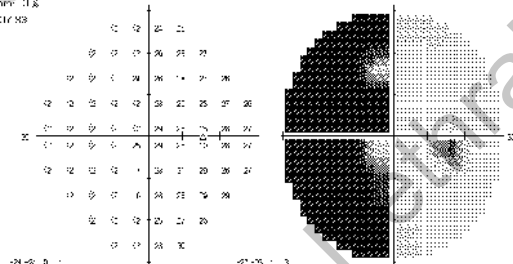
Fixation Monitor: 3 rd Spot  
 Fixation Target: Central  
 Fixation Losses: 0/17  
 Fixation Losses - mean: 0.0%  
 Fixation NFI - mean: 0.0%  
 Test Duration: 11/25

Stimulus III, White  
 Background: 31.5 AFB  
 Strategy: N14 - Standard

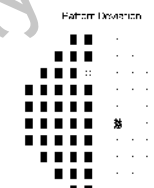
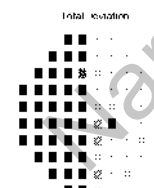
Pupil Diameter: 3.0 mm  
 Visual Acuity: 6/9  
 40 + 2 MDSI -13 MDSI X NFI

Date: 09-11-2016  
 Time: 2:39 PM  
 Age: 67

Flows: 34 dB



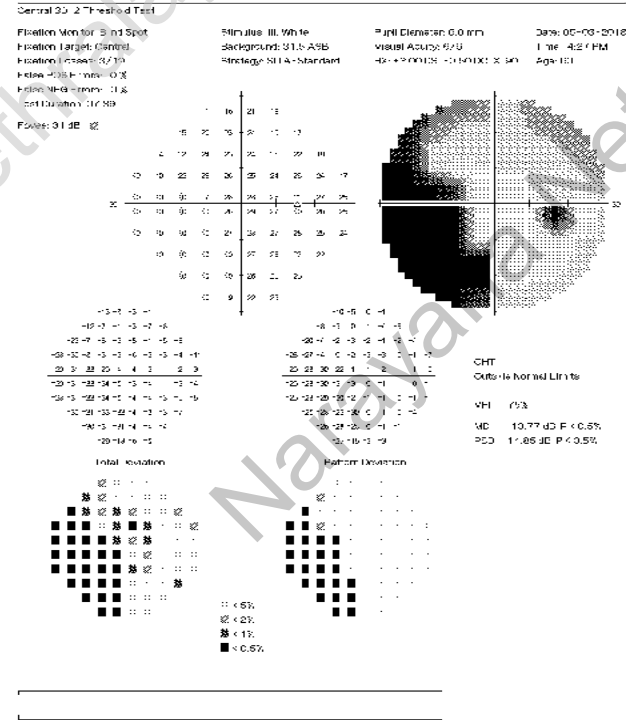
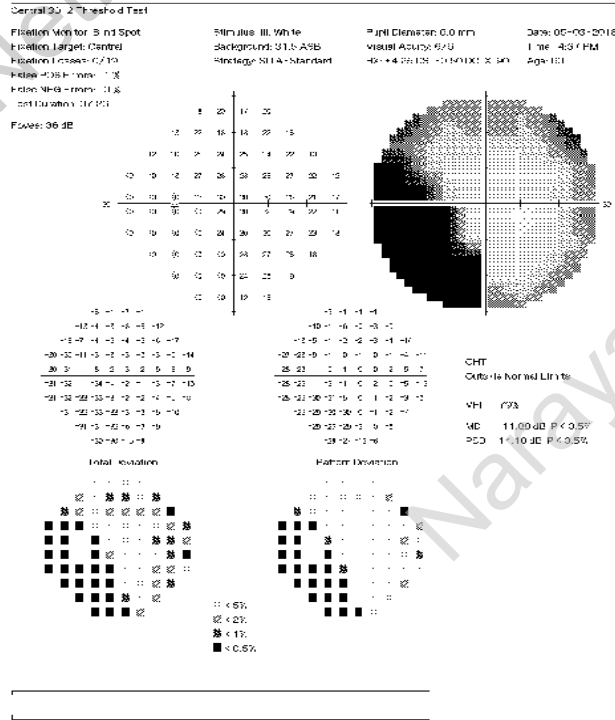
CHT  
 Cuts-to-Normal Limits  
 VFI: 54%  
 MD: 16.05 dB P < 0.5%  
 PSD: 15.94 dB P < 0.5%



# INCONGRUOUS LEFT HOMONYMOUS HEMIANOPIA

## LE

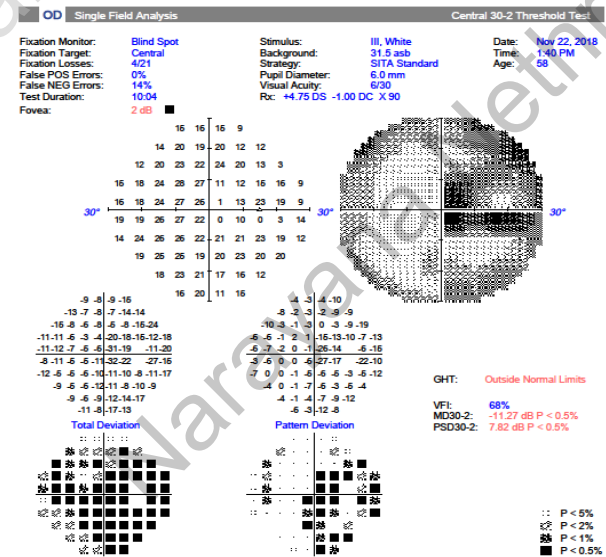
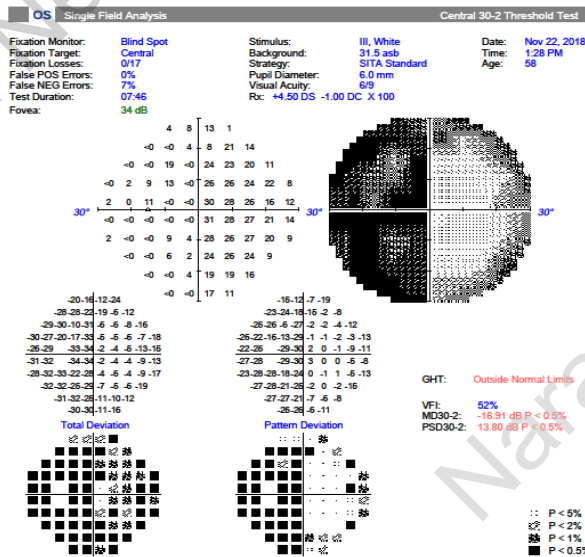
## RE



# BITEMPORAL HEMIANOPIA

LE

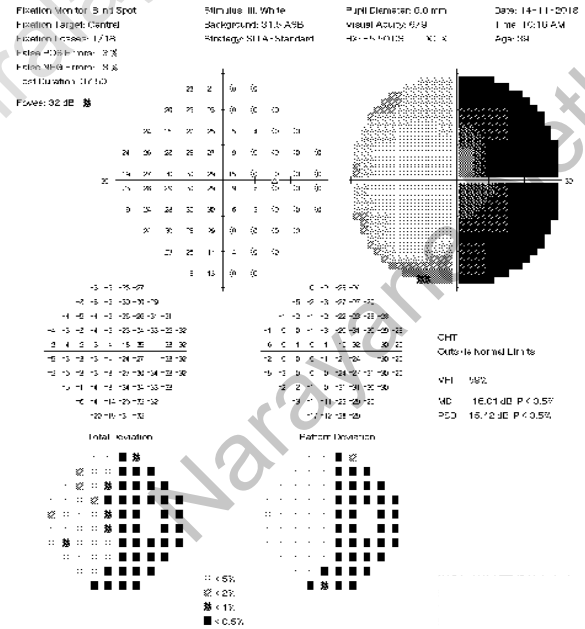
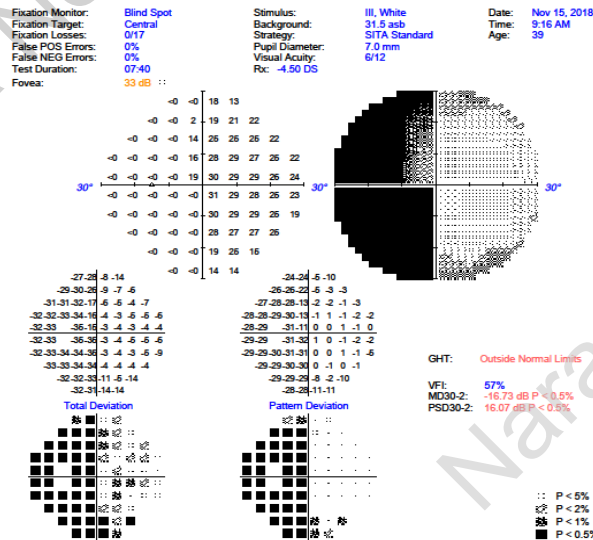
RE



# BITEMPORAL HEMIANOPIA

LE

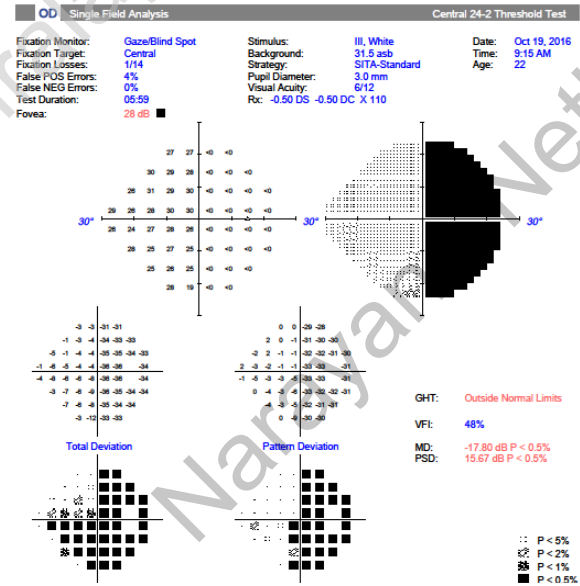
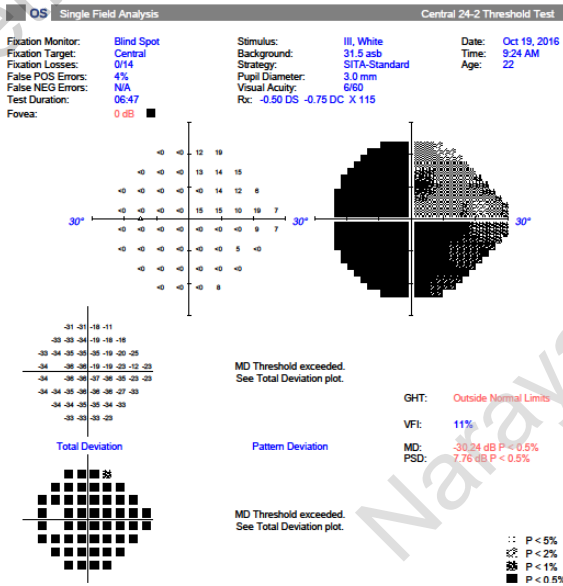
RE



# PITUITARY MACROADENOMA

## SEVERE VISUAL LOSS

## TEMPORAL HEMIFIELD





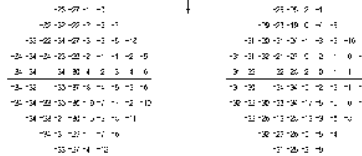
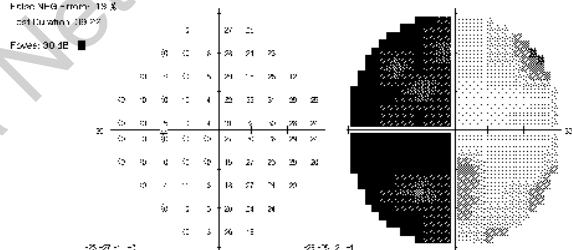


# CRANIOPHARYNGIOMA

Fixation Monitor: Bin3 Spot  
 Fixation Target: Central  
 Fixation Losses: 1/21  
 Fixate -0.06 Hz/min: 0.2  
 Fixate N/A -min: 1.5 X  
 Test Duration: 08:22

Stimulus III, White  
 Background: 31.5-A9B  
 Strategy: SIIA-Standard

Pupil Diameter: 3.0 mm  
 Visual Acuity: 6/24  
 Date: 25-03-2017  
 Time: 4:04 PM  
 Age: 11

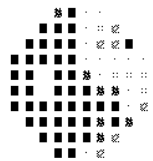


CHT  
 Outliers: None  
 VHI: 51%

MD: 17.61 dB F < 0.5%  
 PSD: 16.76 dB F < 0.5%

Total Evaluation

Pattern Deviation

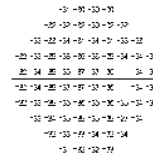
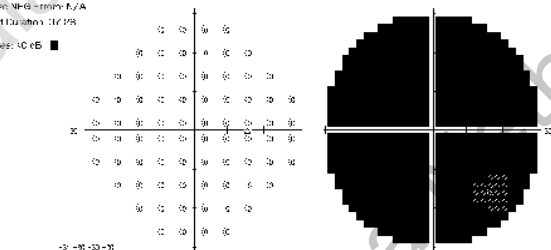


■ < 5%  
 ■ < 2%  
 ■ < 1%  
 ■ < 0.5%

Fixation Monitor: Bin3 Spot  
 Fixation Target: Central  
 Fixation Losses: 0/21  
 Fixate -0.06 Hz/min: 4.2  
 Fixate N/A -min: 1.2 A  
 Test Duration: 07:58

Stimulus III, White  
 Background: 31.5-A9B  
 Strategy: SIIA-Standard

Pupil Diameter: 3.0 mm  
 Visual Acuity: 6/30  
 Date: 25-03-2017  
 Time: 4:11 PM  
 Age: 11



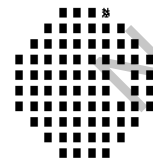
Pattern Deviation not shown for severely depressed fields. Refer to Total Deviation.

CHT  
 Outliers: None  
 VHI: 0%

MD: 34.07 dB F < 0.5%  
 PSD: 2.22 dB

Total Evaluation

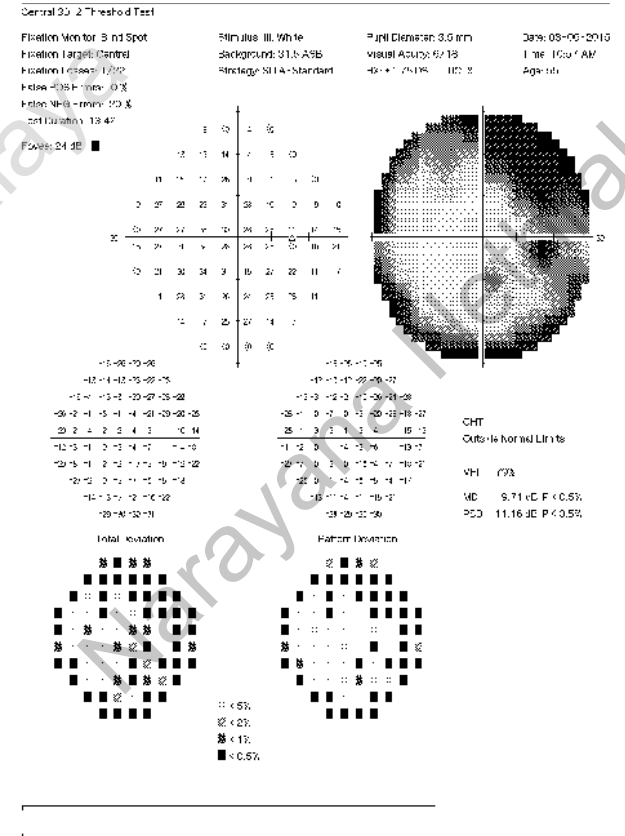
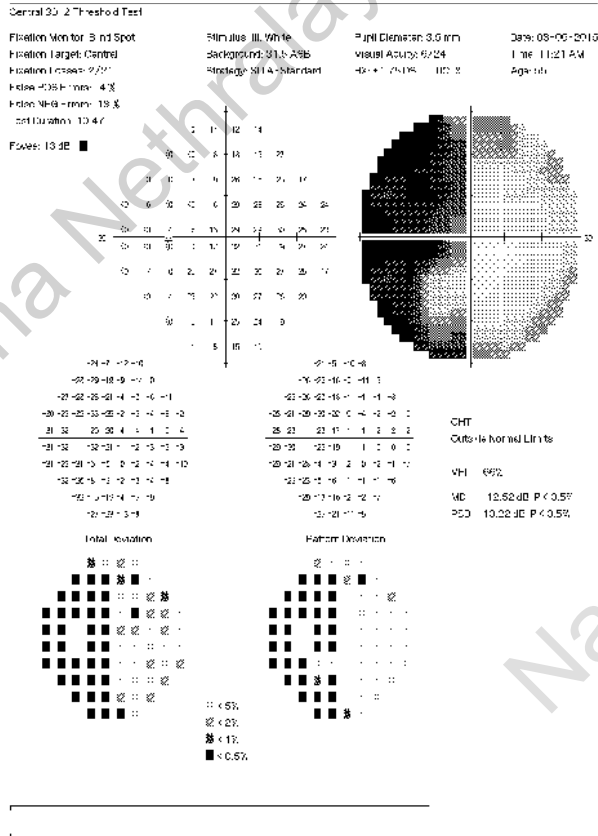
Pattern Deviation



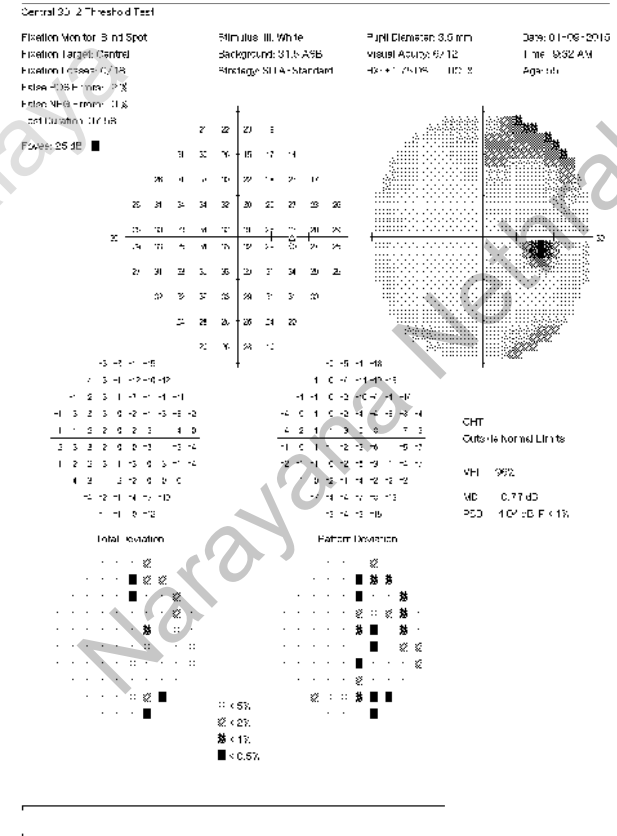
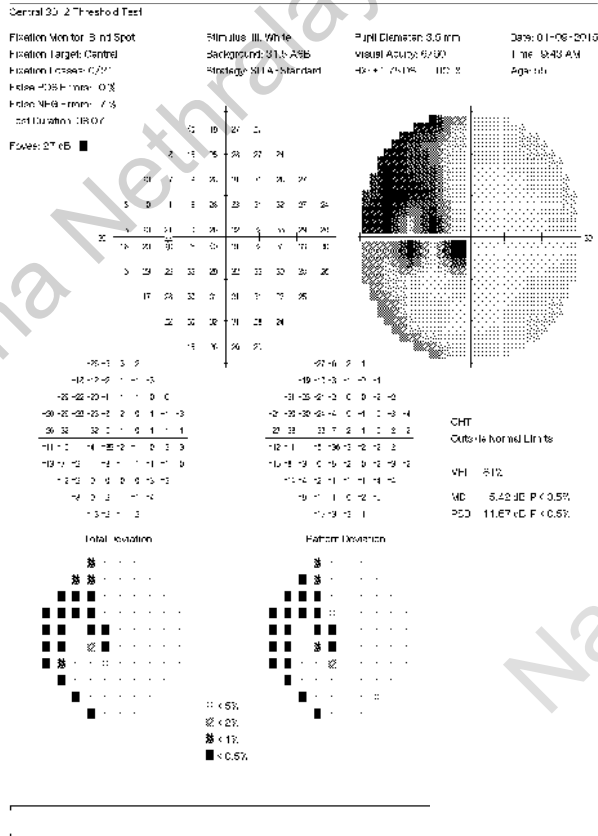
■ < 5%  
 ■ < 2%  
 ■ < 1%  
 ■ < 0.5%

Pattern Deviation not shown for severely depressed fields. Refer to Total Evaluation.

# PITUITARY MACROADENOMA



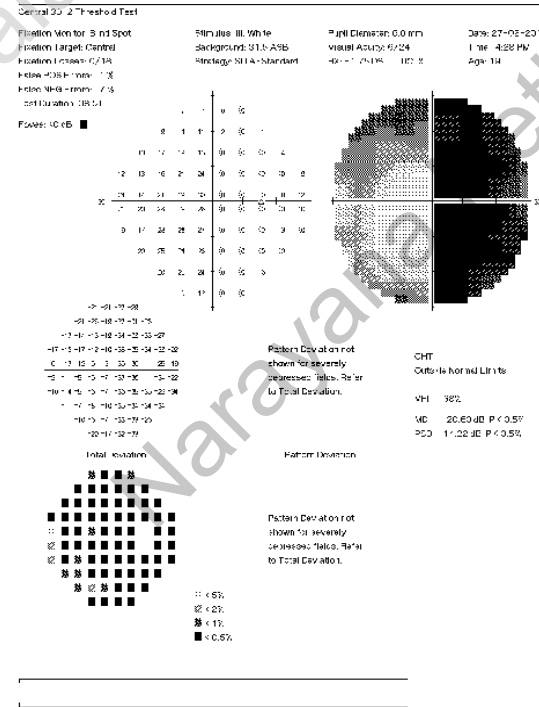
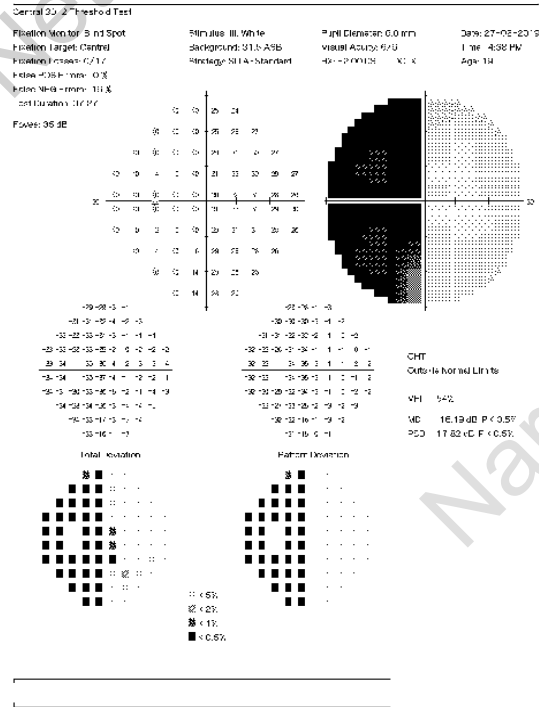
# POST OP-TNTS



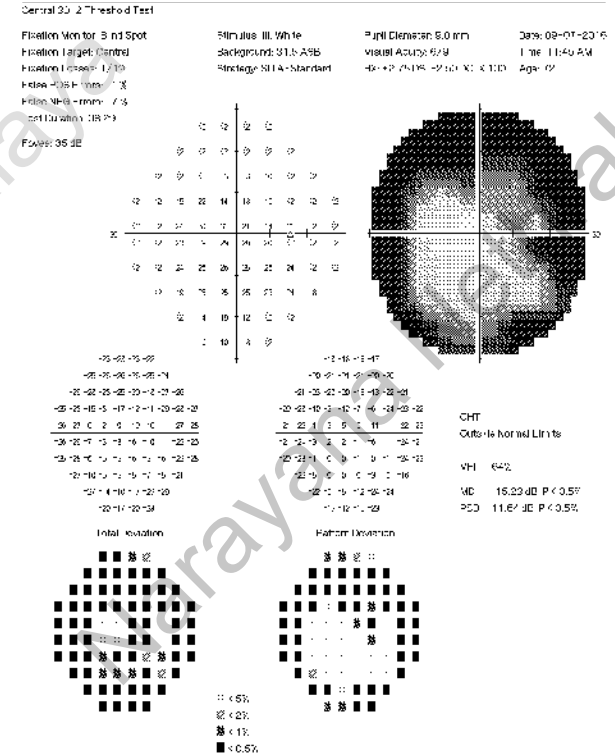
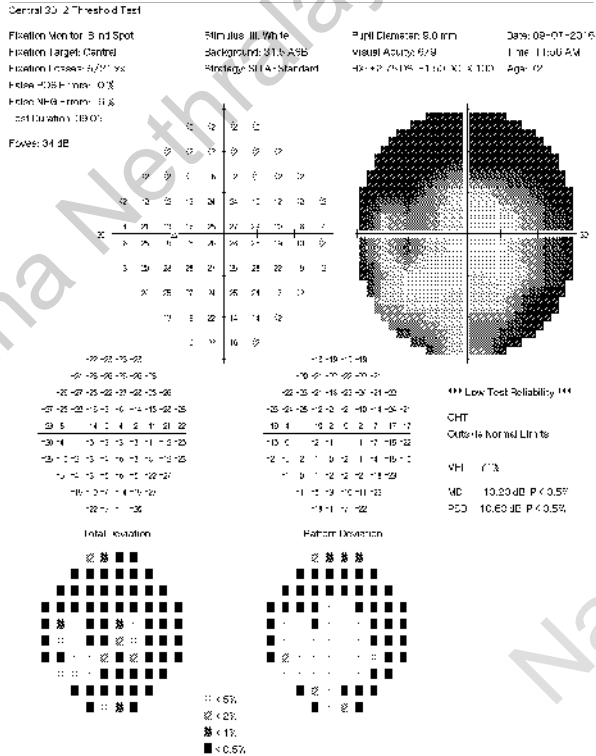
# OPTIC CHIASM GLIOMA

LE

RE



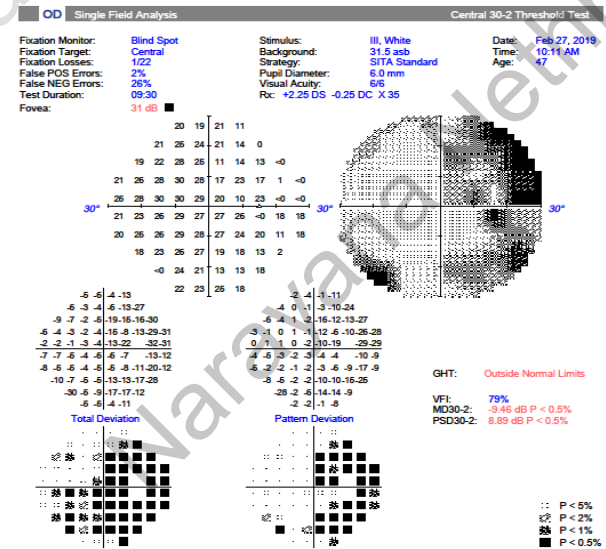
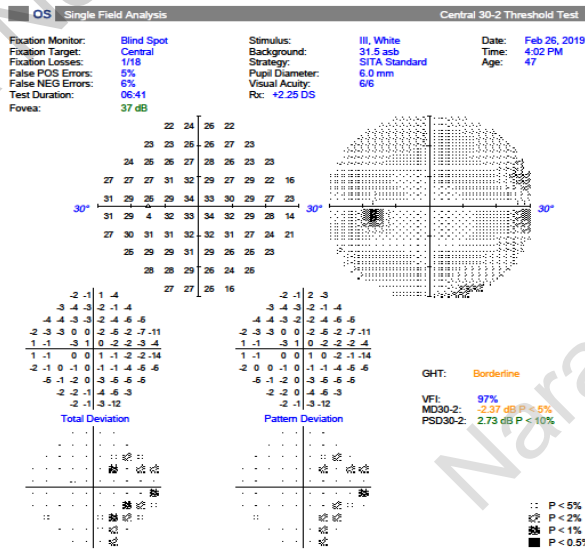
# RP+PITUITARY ADENOMA- RING SCOTOMA



# EN PLAQUE MENINGIOMA

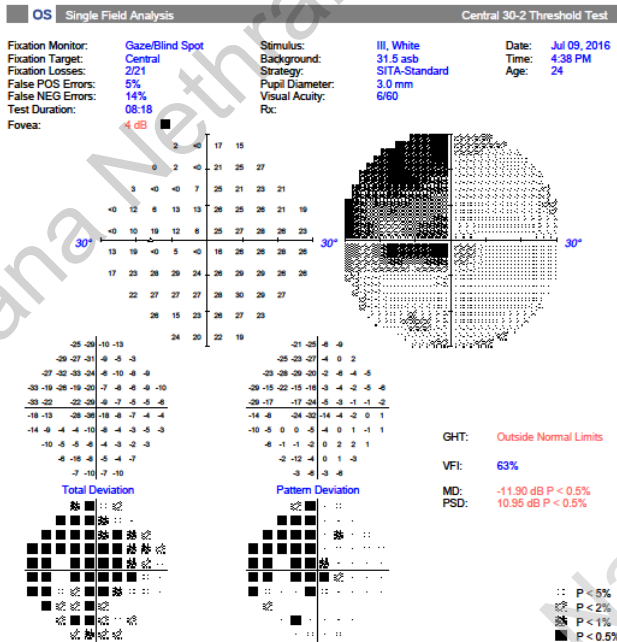
LE

RE



# TRAUMATIC OPTIC NEUROPATHY

- RE-no PL due to traumatic optic neuropathy





**ALWAYS CORRELATE THE VISUAL  
FIELDS WITH OTHER CLINICAL  
FINDINGS**

**THANK YOU**