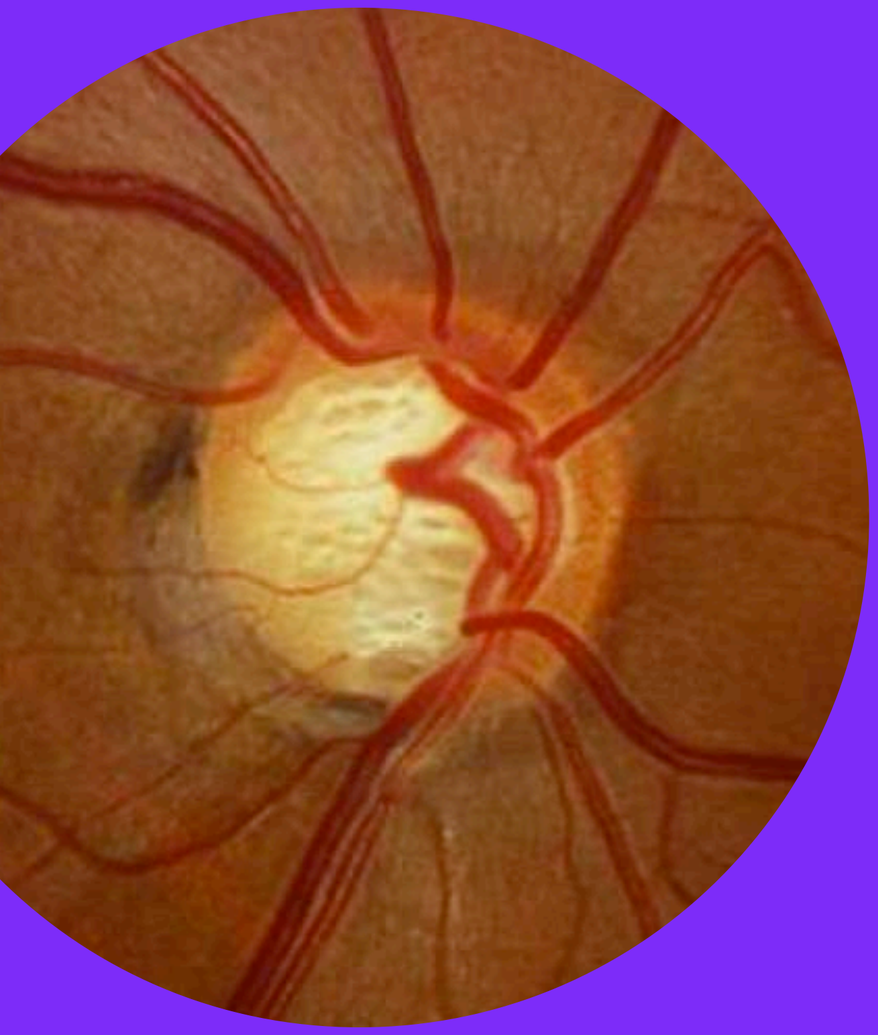

Dr Kerr

# To get ready, please visit the URL below

doctorkerr.com.au/interact



# Glaucoma Management:

## When, Which, and How

Dr. Nathan Kerr

Saving sight. Changing lives.

# Welcome

## Dr. Nathan Kerr

**Glaucoma and Cataract Surgeon**

# About me

THE UNIVERSITY OF AUCKLAND
NEW ZEALAND

the royal victorian eye and ear hospital

Moorfields Eye Hospital NHS
NHS Foundation Trust

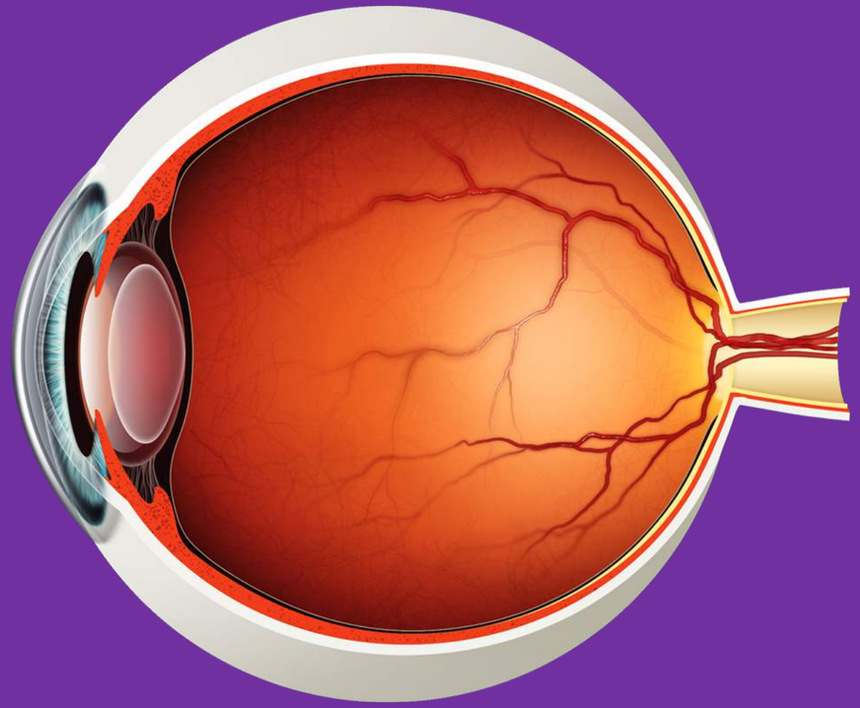
CENTRE FOR Eye Research Australia

# Learning objectives

01 Identify the salient principles in the diagnosis and management of glaucoma

02 Discuss the main factors in determining when to commence the treatment of a case of glaucoma

03 Consider the treatment options and be able to customise an individual regime for each patient



*“A group of progressive optic neuropathies characterised by degeneration of retinal ganglion cells and retinal nerve fibre layer resulting in changes in the optic nerve head”*

# Glaucoma

## Goals

01 Individualise care

02 Preserve visual function

03 Promote quality of life

# Glaucoma in Australia

# Glaucoma in Australia

**1:8 people**
Over 80 years

**600,000**
Australians

**#1 cause**
Irreversible blindness

# Glaucoma in Australia

tvst

DOI: 10.1167/tvst.4.2.1

Perspective

## Why Do People (Still) Go Blind from Glaucoma?

Remo Susanna Jr.[1], Carlos Gustavo De Moraes[2], George A. Cioffi[2], and Robert Ritch[3]

[1] Department of Ophthalmology, University of Sao Paulo School of Medicine, Sao Paulo, SP, Brazil
[2] Department of Ophthalmology, Columbia University Medical Center, New York, NY, USA
[3] Einhorn Clinical Research Center, New York Eye & Ear Infirmary of Mount Sinai, New York, NY, USA

Susanna R, De Moraes CG, Cioffi GA, Ritch R. Why do people (still) go blind from glaucoma? Translational Vision Science & Technology. 2015 Mar;4(2):1-12

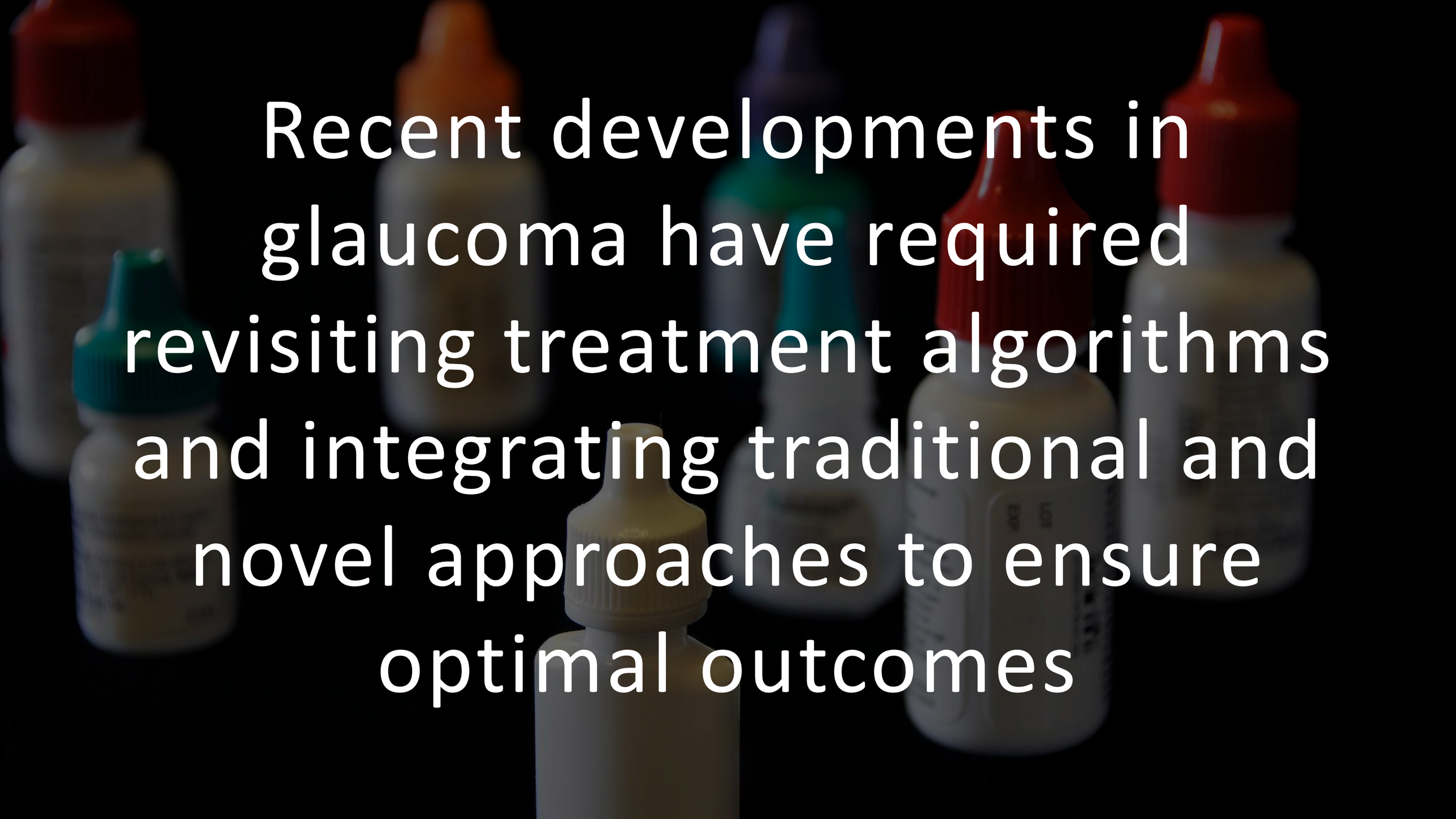
# Glaucoma in Australia

01 Glaucoma is (still) undiagnosed

02 Glaucoma is (still) improperly treated

03 (Still) lack of adherence

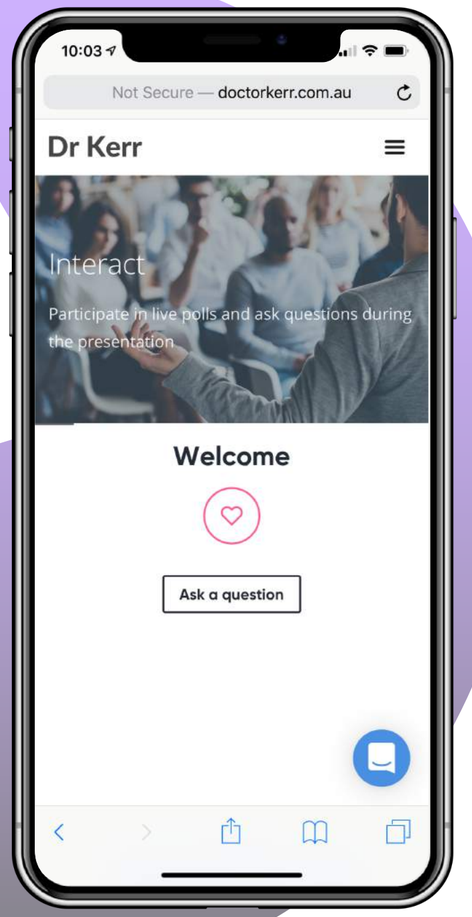
Susanna R, De Moraes CG, Cioffi GA, Ritch R. Why do people (still) go blind from glaucoma? Translational Vision Science & Technology. 2015 Mar;4(2):1-12



Recent developments in glaucoma have required revisiting treatment algorithms and integrating traditional and novel approaches to ensure optimal outcomes

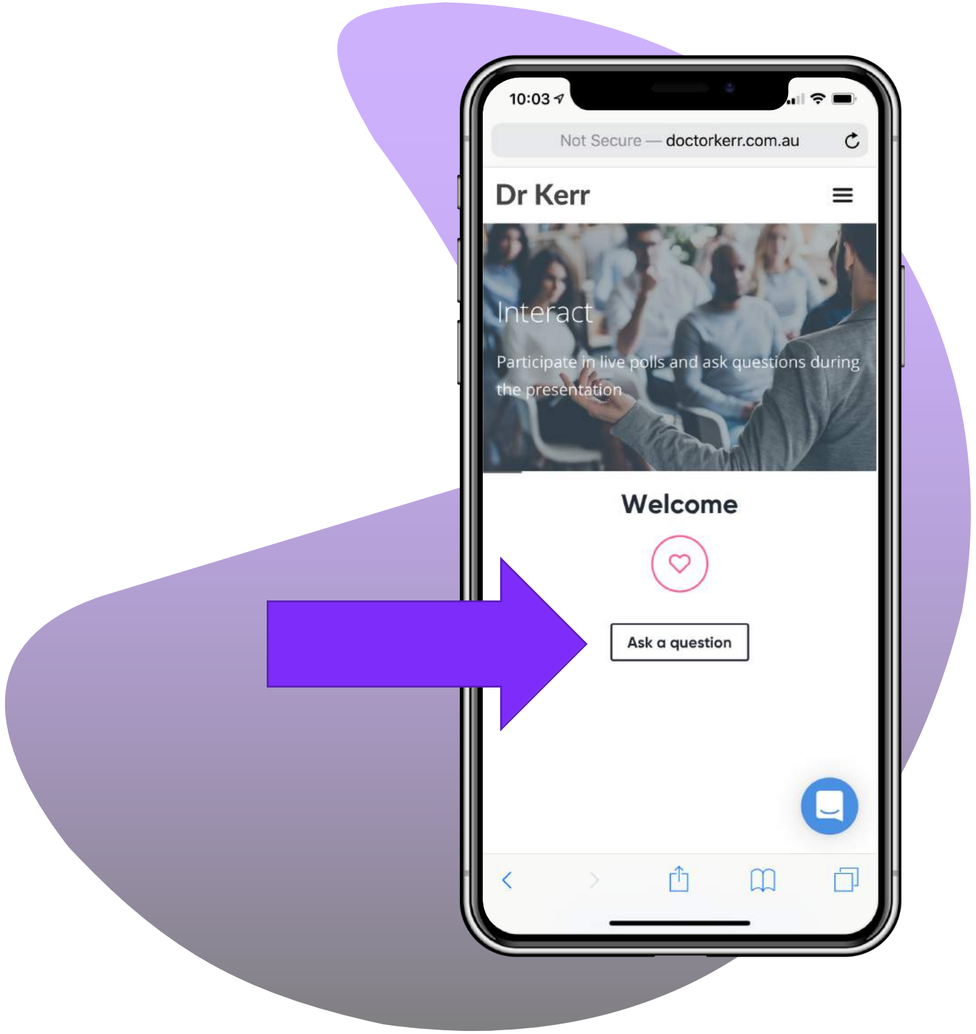
# Interactive seminar

## 5 clinical cases



# Interactive seminar

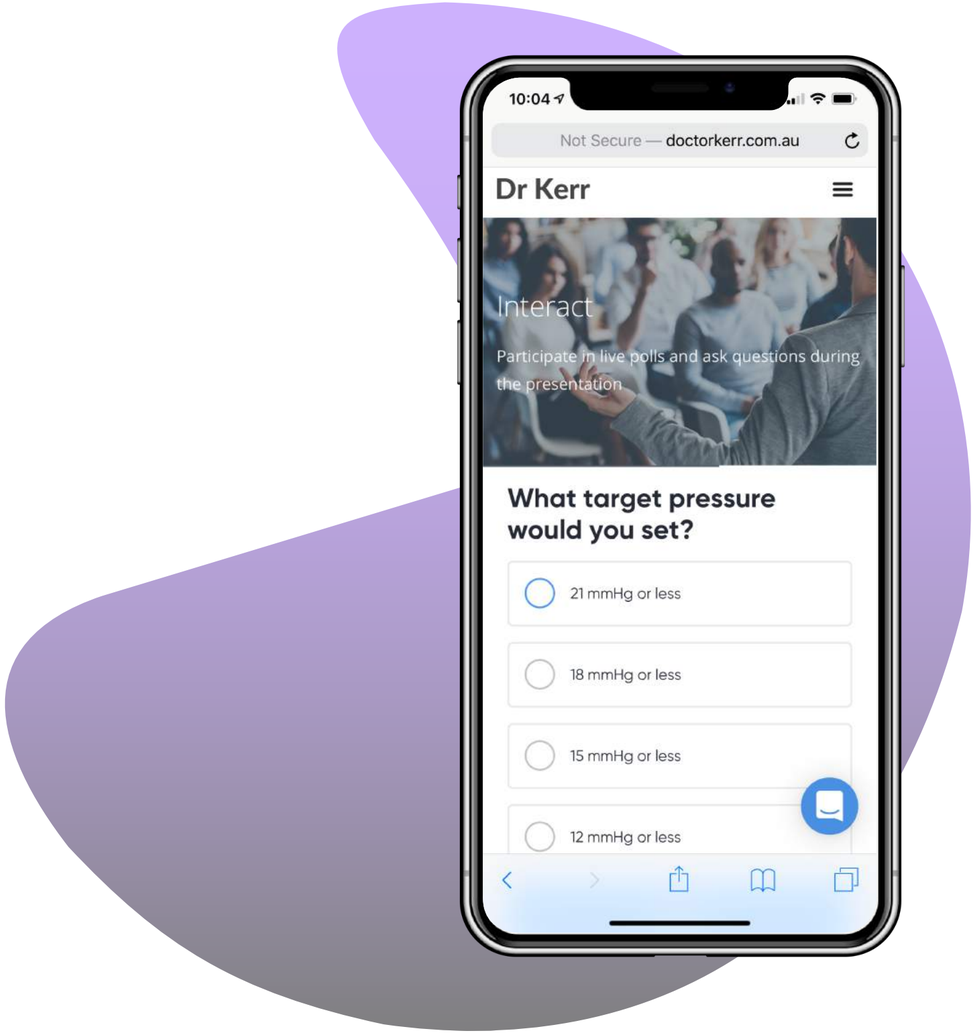
## Ask a question



# Interactive seminar

Ask a question

Vote

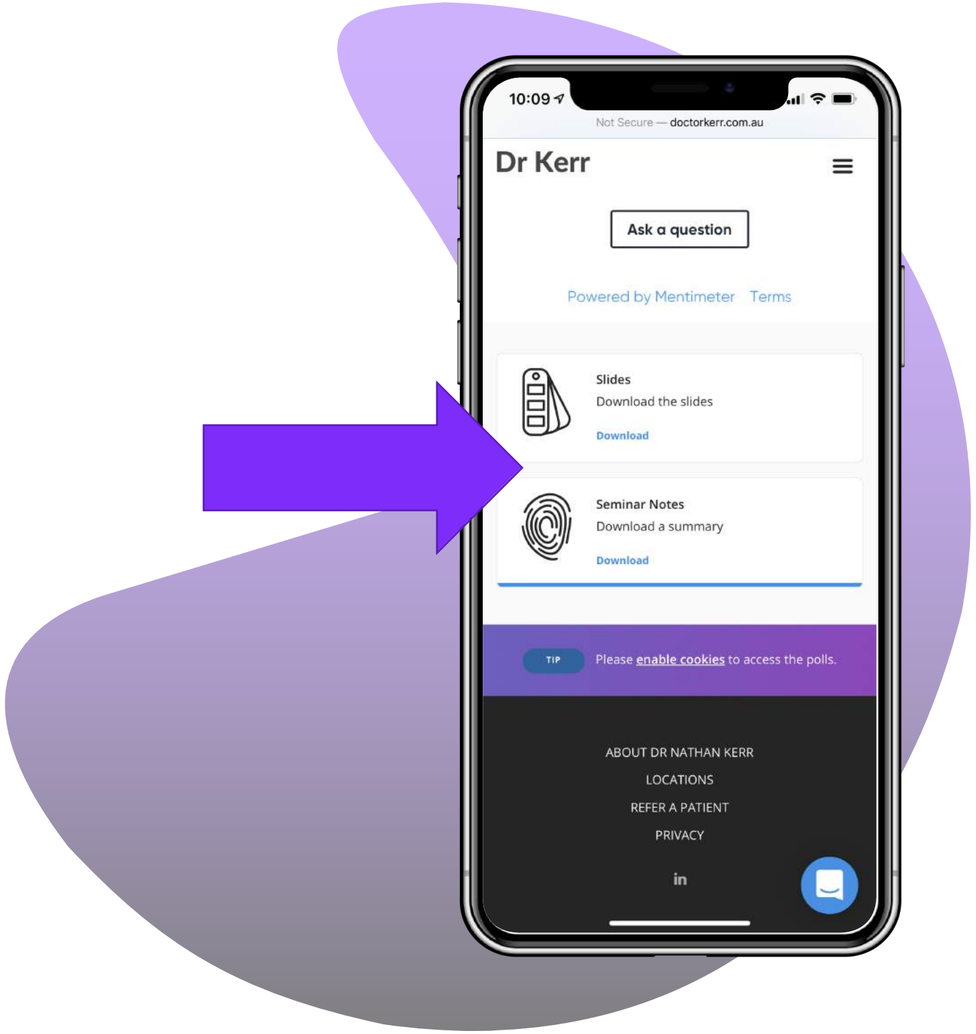


# Interactive seminar

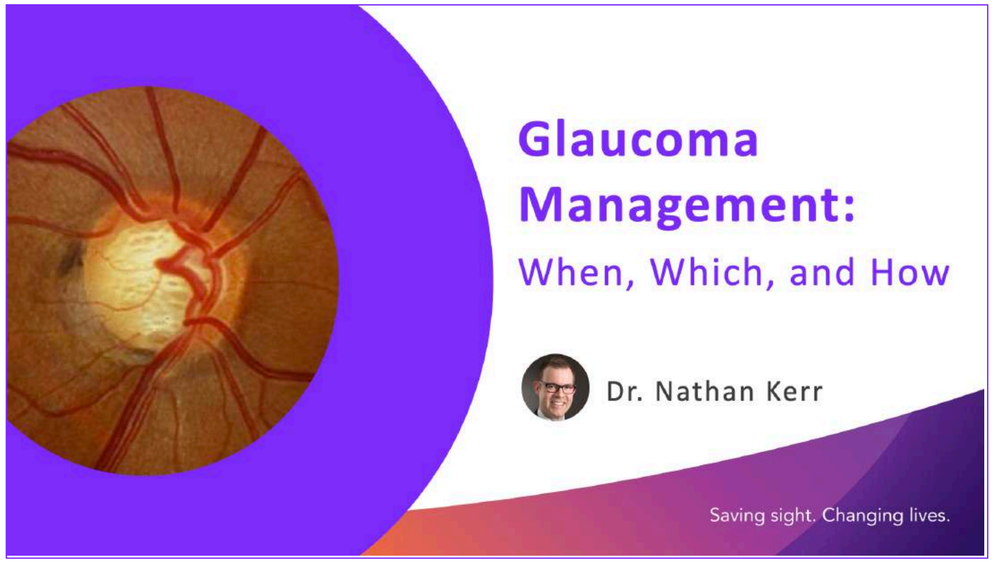
Ask a question

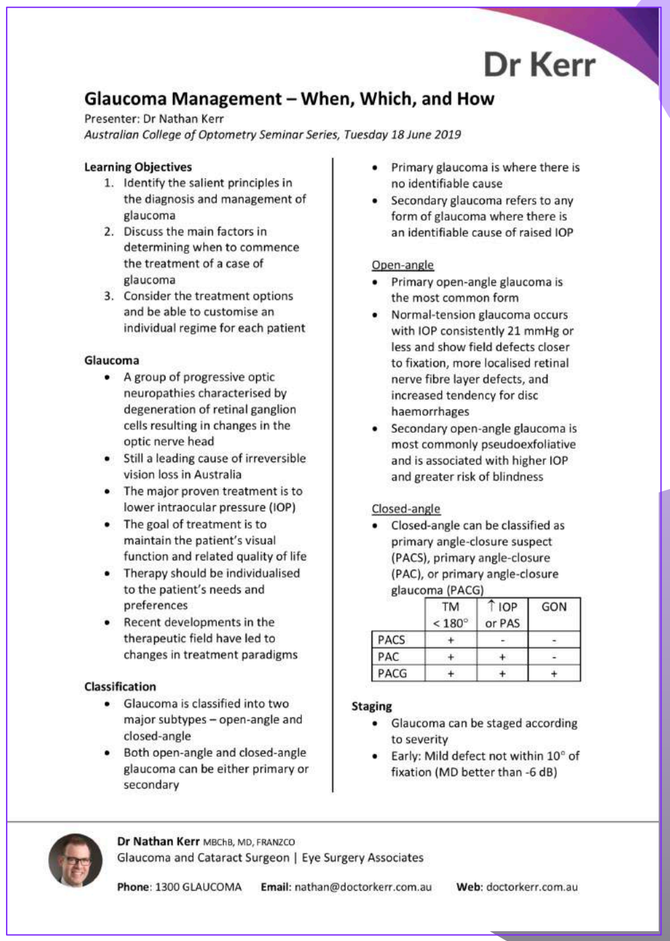
Vote

Download slides or a summary



# Interactive seminar



Dr Kerr

**Glaucoma Management – When, Which, and How**

Presenter: Dr Nathan Kerr

*Australian College of Optometry Seminar Series, Tuesday 18 June 2019*

**Learning Objectives**

1. Identify the salient principles in the diagnosis and management of glaucoma
2. Discuss the main factors in determining when to commence the treatment of a case of glaucoma
3. Consider the treatment options and be able to customise an individual regime for each patient

**Glaucoma**

- A group of progressive optic neuropathies characterised by degeneration of retinal ganglion cells resulting in changes in the optic nerve head
- Still a leading cause of irreversible vision loss in Australia
- The major proven treatment is to lower intraocular pressure (IOP)
- The goal of treatment is to maintain the patient's visual function and related quality of life
- Therapy should be individualised to the patient's needs and preferences
- Recent developments in the therapeutic field have led to changes in treatment paradigms

**Classification**

- Glaucoma is classified into two major subtypes – open-angle and closed-angle
- Both open-angle and closed-angle glaucoma can be either primary or secondary
- Primary glaucoma is where there is no identifiable cause
- Secondary glaucoma refers to any form of glaucoma where there is an identifiable cause of raised IOP

Open-angle

- Primary open-angle glaucoma is the most common form
- Normal-tension glaucoma occurs with IOP consistently 21 mmHg or less and show field defects closer to fixation, more localised retinal nerve fibre layer defects, and increased tendency for disc haemorrhages
- Secondary open-angle glaucoma is most commonly pseudoexfoliative and is associated with higher IOP and greater risk of blindness

Closed-angle

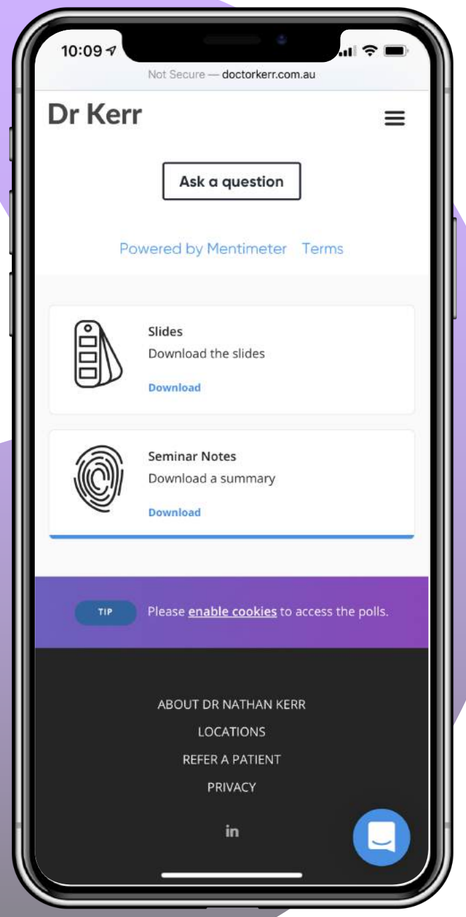
- Closed-angle can be classified as primary angle-closure suspect (PACS), primary angle-closure (PAC), or primary angle-closure glaucoma (PACG)

| | TM < 180° | ↑ IOP or PAS | GON |
|---|---|---|---|
| PACS | + | - | - |
| PAC | + | + | - |
| PACG | + | + | + |

**Staging**

- Glaucoma can be staged according to severity
- Early: Mild defect not within 10° of fixation (MD better than -6 dB)

**Dr Nathan Kerr** MBChB, MD, FRANZCO
Glaucoma and Cataract Surgeon | Eye Surgery Associates
**Phone**: 1300 GLAUCOMA **Email**: nathan@doctorkerr.com.au **Web**: doctorkerr.com.au

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# — Case 1

Identifying patients at risk of glaucoma

# Case 1

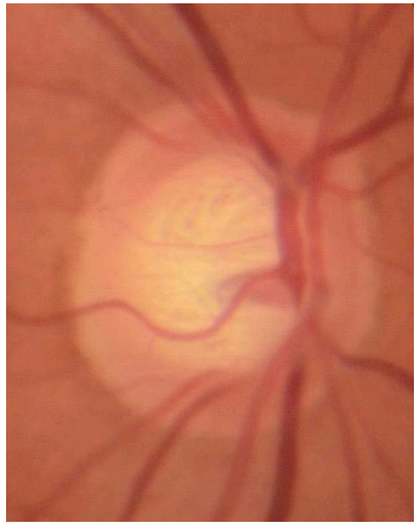
| | |
|---|---|
| Demographics | Female, 56 years old |
| History | Disc cupping and RNFL changes |
| Past ocular history | Myopia. No raised IOP. |
| Past medical history | Osteoarthritis |
| Family history | Nil |

# Case 1

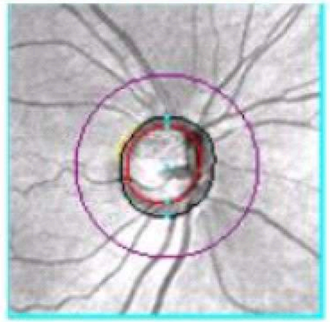
## What would you like to ask about her past medical history?


# Case 1

| Right eye | Examination | Left eye |
| --- | --- | --- |
| 6/4.8 | Visual acuity | 6/4.8 |
| -0.25/-0.75x80 | Refraction | 0.00/-1.00x90 |
| 13 | IOP | 13 |
| 529 | CCT | 531 |
| Deep & quiet | AC | Deep & quiet |
| Grade 4 | Gonio | Grade 4 |
| No cataract | Lens | No cataract |
| 0.8 | Fundus | 0.8 |

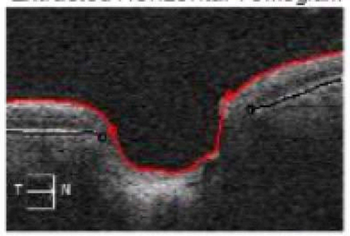


RNFL Deviation Map

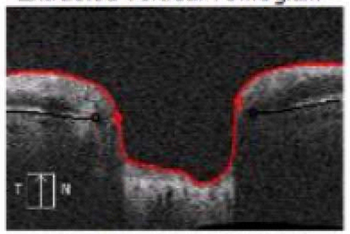


Disc Center(0.00,-0.09)mm

Extracted Horizontal Tomogram

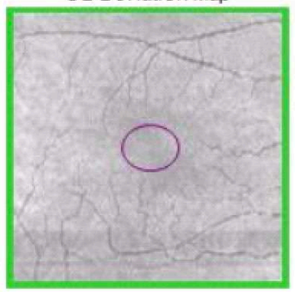


Extracted Vertical Tomogram

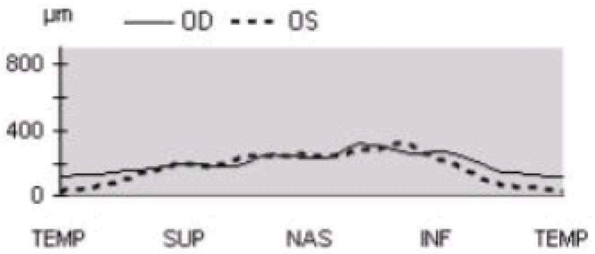


RNFL Circular Tomogram

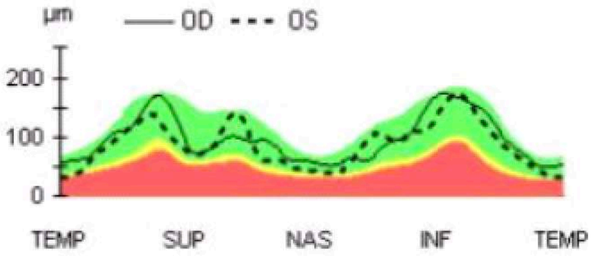
OD Deviation Map

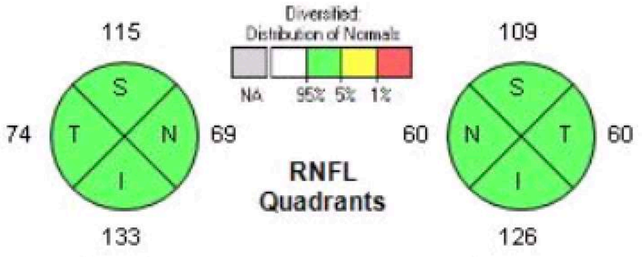


Neuro-retinal Rim Thickness

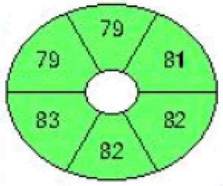


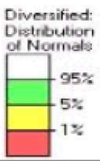

RNFL Thickness



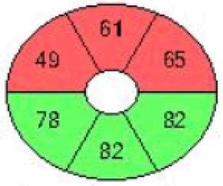




OD Sectors



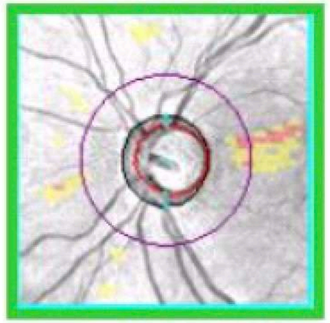




OS Sectors



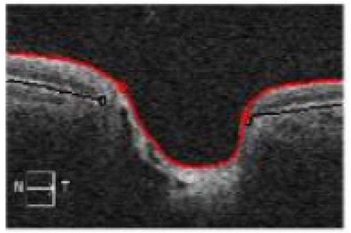

| | OD µm | OS µm |
|---|---|---|
| Average GCL + IPL Thickness | 81 | 70 |
| Minimum GCL + IPL Thickness | 82 | 44 |

RNFL Deviation Map

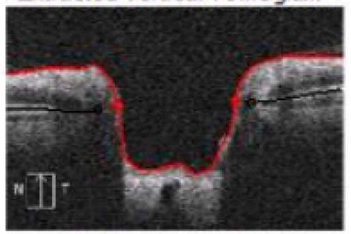


Disc Center(0.00,0.03)mm

Extracted Horizontal Tomogram

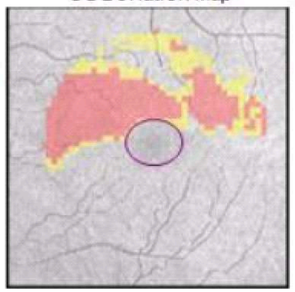


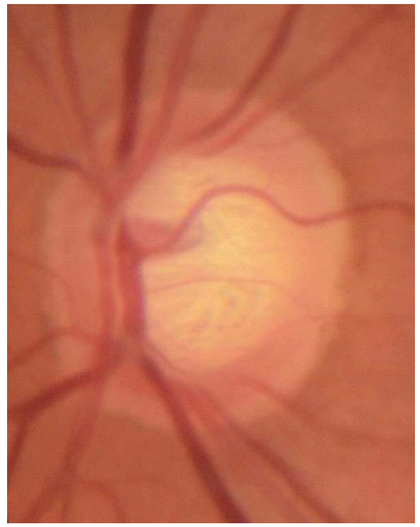
Extracted Vertical Tomogram



RNFL Circular Tomogram

OS Deviation Map





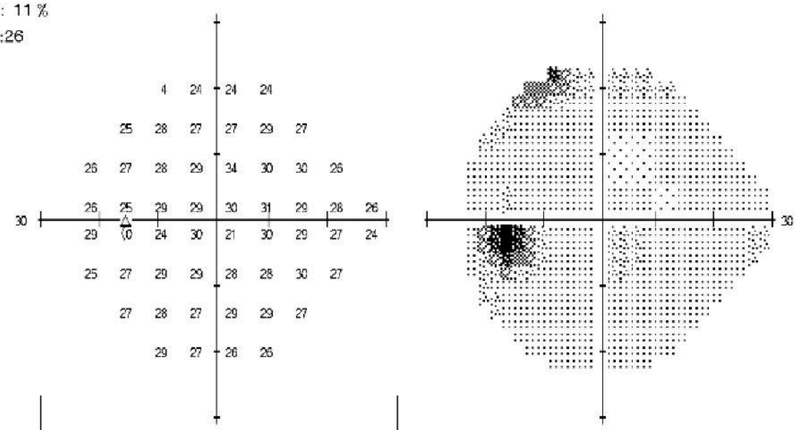
Fixation Monitor: Gaze/Blind Spot
Fixation Target: Central
Fixation Losses: 3/15 xx
False POS Errors: 2 %
False NEG Errors: 11 %
Test Duration: 05:26

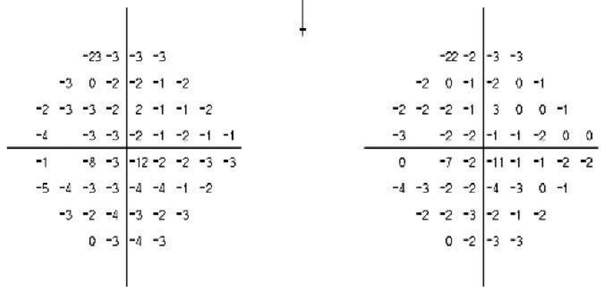
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard

Pupil Diameter:
Visual Acuity:
RX: +2.50 DS DC X

Date: 17-06-2019
Time: 2:24 PM
Age: 56

Fovea: OFF





Total Deviation



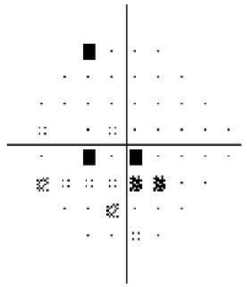
Pattern Deviation

*** Low Test Reliability ***

GHT
Outside Normal Limits

VFI 96%

MD -2.85 dB P < 2%
PSD 3.01 dB P < 2%



:: < 5%
▒ < 2%
▓ < 1%
■ < 0.5%

Eye Surgery Associates

Level 2, 232 Victoria Pde.
East Melbourne Vic 3002
Ph. 03 9416 0695

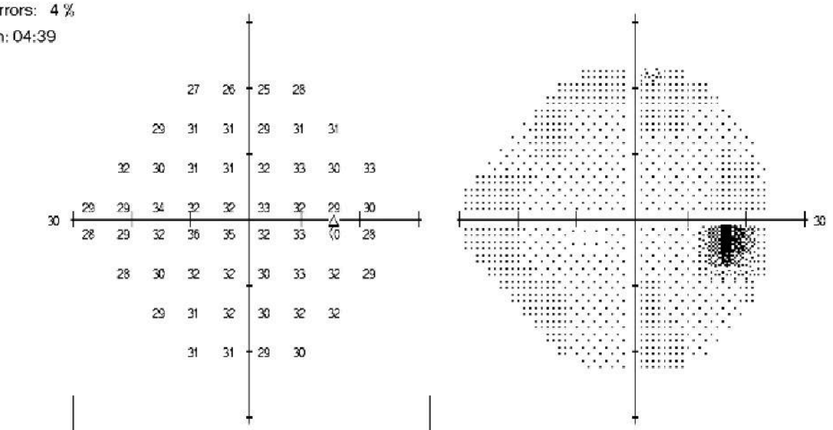
Fixation Monitor: Gaze/Blind Spot
Fixation Target: Central
Fixation Losses: 1/13
False POS Errors: 3 %
False NEG Errors: 4 %
Test Duration: 04:39

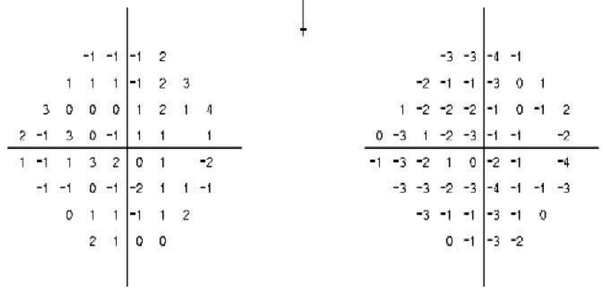
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard

Pupil Diameter:
Visual Acuity:
RX: +2.50 DS DC X

Date: 17-06-2019
Time: 2:18 PM
Age: 56

Fovea: OFF





Total Deviation

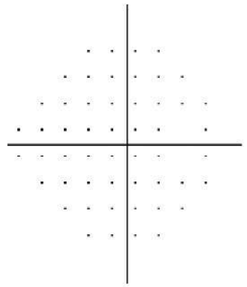


Pattern Deviation

GHT
Within Normal Limits

VFI 100%

MD +0.57 dB
PSD 1.46 dB



:: < 5%
▒ < 2%
▓ < 1%
■ < 0.5%

Eye Surgery Associates

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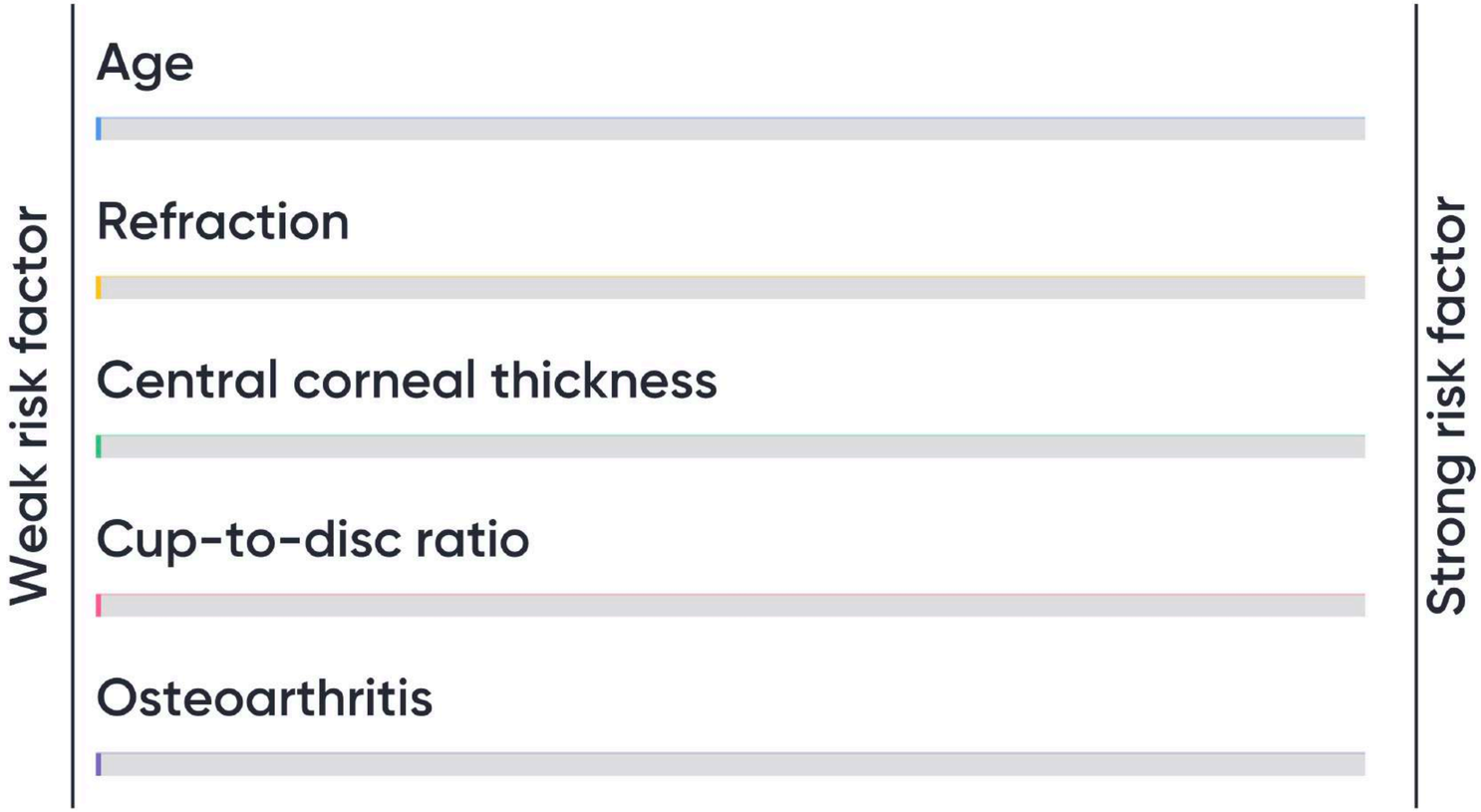
East Melbourne Vic 3002
Ph. 03 9416 0695

# Which of the following are risk factors for glaucoma?




Slide is not active Activate

0 0

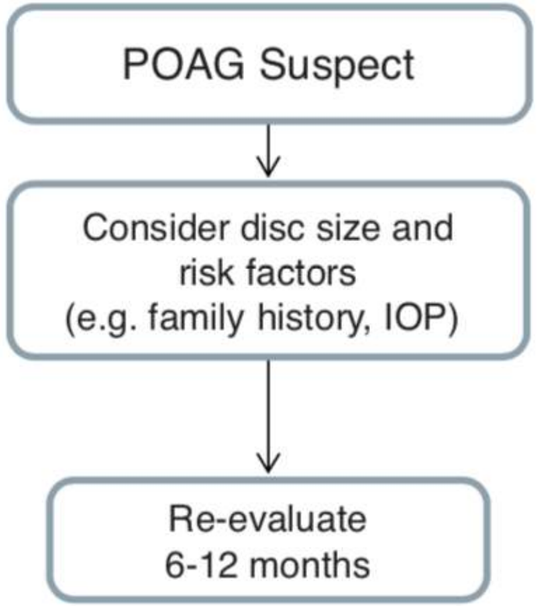
# Major risk factors for glaucoma

| | |
|---|---|
| Age | • Exponential increase with age |
| Race | • African people at 5x risk |
| Family history | • First degree relatives at 3x to 6x risk |
| Refractive error | • Increased risk with myopia hyperopia |
| IOP | • Increased risk for onset / progression |
| CCT | • Increased risk with thin CCT |

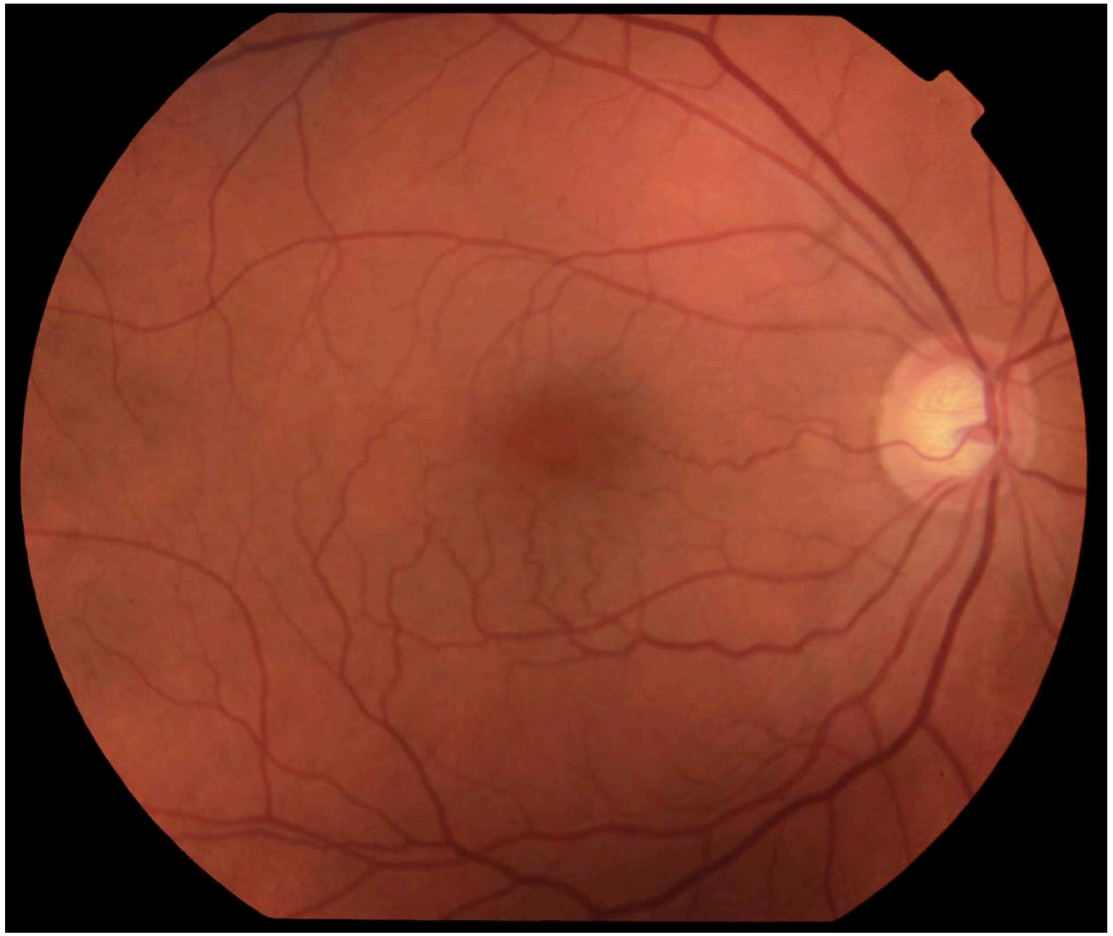
# Identifying those at risk of glaucoma

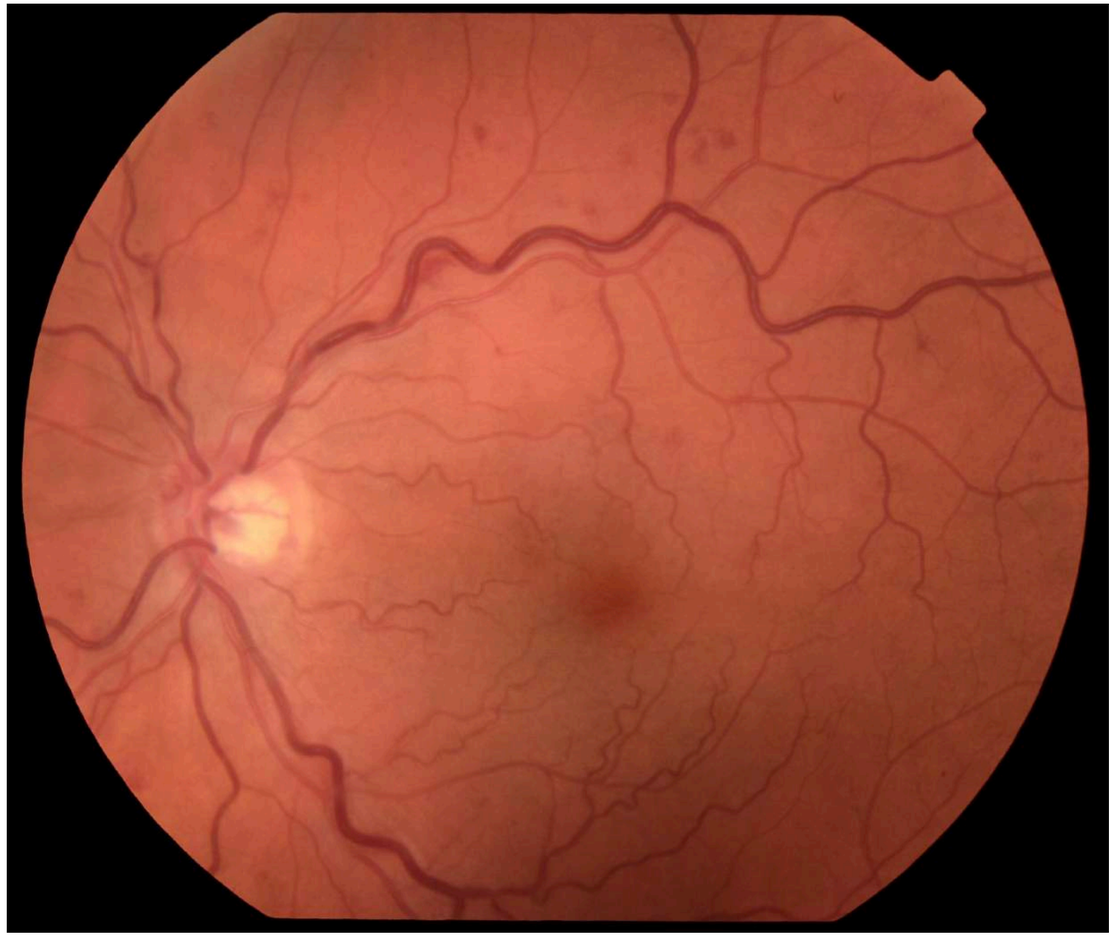
| | |
|---|---|
| Recommendation | • Identify and assess glaucoma patients and suspects (those at high risk of disease) |
| Good practice | • Perform regular eye health checks on all first-degree relatives of glaucoma patients |
| Good practice | • Survey for glaucoma in patients over 50 especially with myopia, hypertension, diabetes, peripheral vasospasm, steroid use, or eye injury |

# Assessment and follow-up



# 6 months prior…





# — Case 2

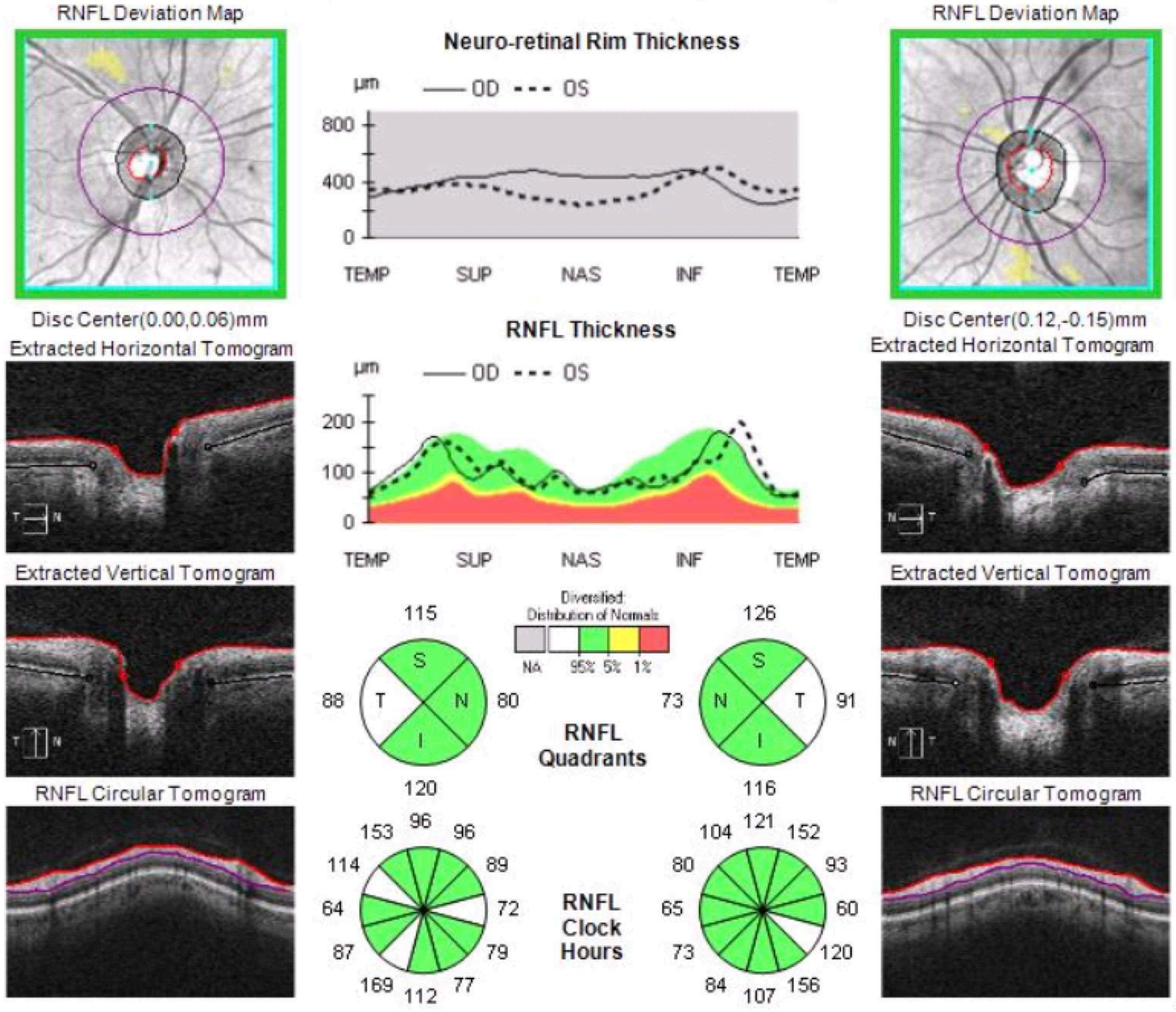
Ocular hypertension

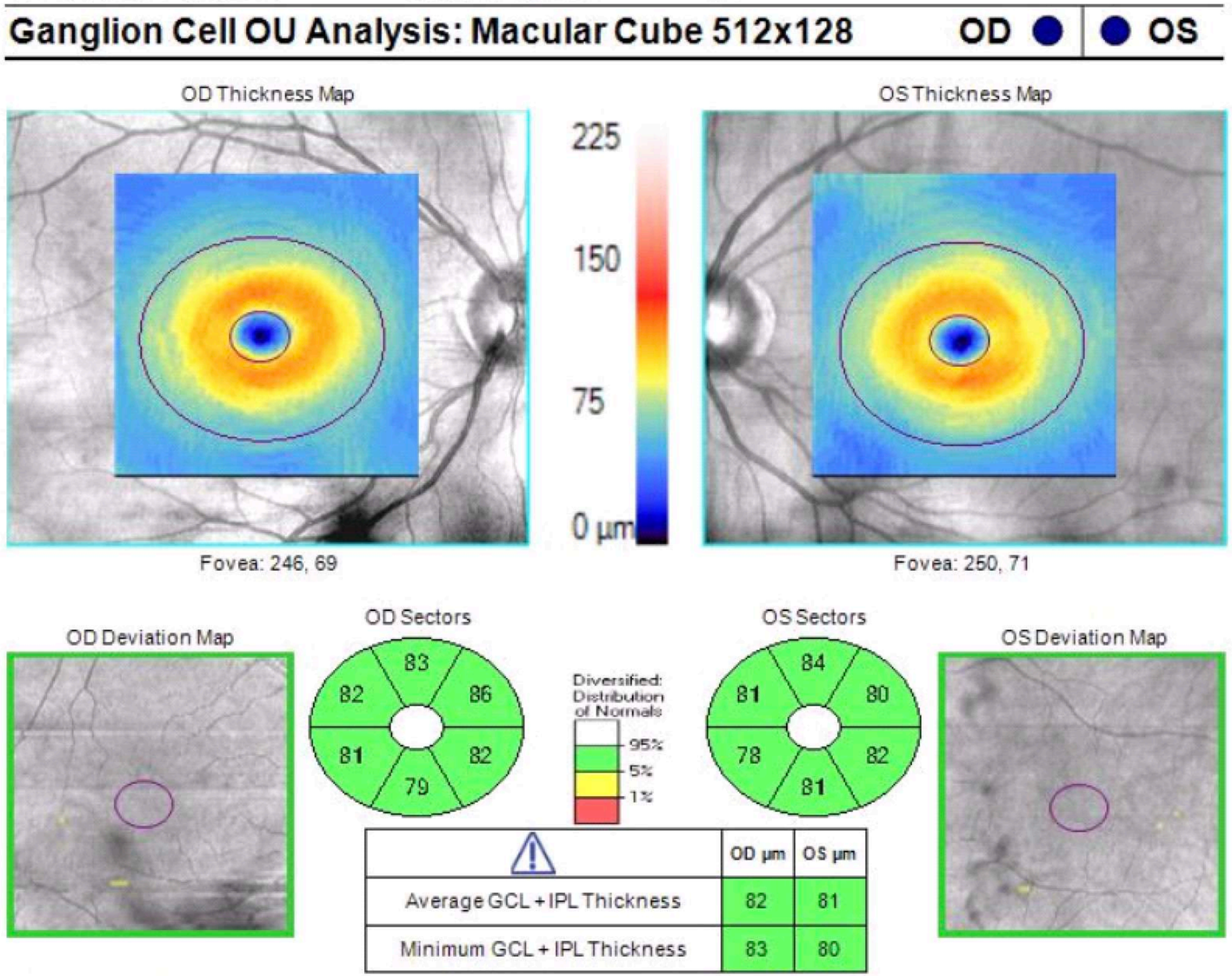
# Case 2

| | |
|---|---|
| Demographics | Female, 54 years old |
| History | Asymptomatic |
| Past ocular history | Nil |
| Past medical history | Depression |
| Family history | Glaucoma - mother and grandmother |

# Case 2

| Right eye | Examination | Left eye |
| --- | --- | --- |
| 6/6 | Visual acuity | 6/6 |
| Plano | Refraction | Plano |
| 23 | IOP | 25 |
| 575 | CCT | 585 |
| Deep & quiet | AC | Deep & quiet |
| Grade 4 | Gonio | Grade 4 |
| No cataract | Lens | No cataract |
| 0.5 | Fundus | 0.5 |


RNFL Deviation Map
Neuro-retinal Rim Thickness
µm
OD
OS
800
400
0
TEMP
SUP
NAS
INF
TEMP
RNFL Deviation Map
Disc Center(0.00,0.06)mm
Extracted Horizontal Tomogram
RNFL Thickness
µm
OD
OS
200
100
0
TEMP
SUP
NAS
INF
TEMP
Disc Center(0.12,-0.15)mm
Extracted Horizontal Tomogram
Extracted Vertical Tomogram
Diversified Distribution of Normals
NA
95%
5%
1%
115
88
80
120
S
T
N
I
RNFL Quadrants
126
73
91
116
Extracted Vertical Tomogram
RNFL Circular Tomogram
153
96
96
114
89
64
72
87
79
169
112
77
RNFL Clock Hours
104
121
152
80
93
65
60
73
120
84
107
156
RNFL Circular Tomogram


Ganglion Cell OU Analysis: Macular Cube 512x128
OD
OS
OD Thickness Map
OS Thickness Map
225
150
75
0 µm
Fovea: 246, 69
Fovea: 250, 71
OD Deviation Map
OD Sectors
OS Sectors
OS Deviation Map
83
82
86
81
82
79
84
81
80
78
82
81
Diversified: Distribution of Normals
95%
5%
1%
OD µm
OS µm
Average GCL + IPL Thickness
82
81
Minimum GCL + IPL Thickness
83
80

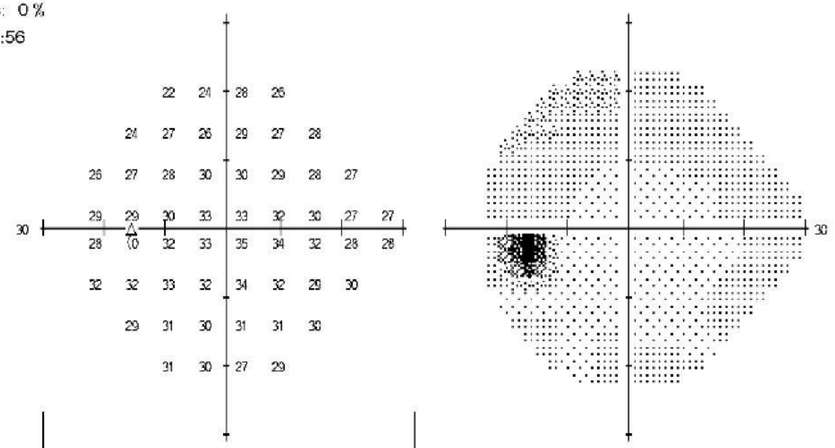
Fixation Monitor: Blind Spot
Fixation Target: Central
Fixation Losses: 0/15
False POS Errors: 0 %
False NEG Errors: 0 %
Test Duration: 05:56

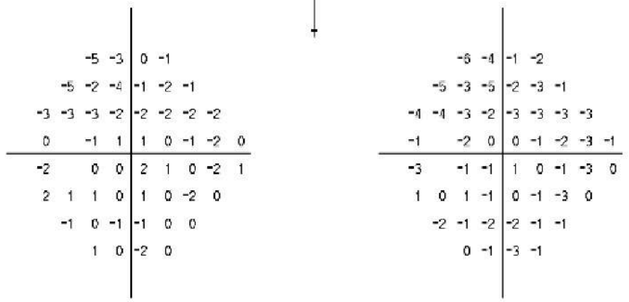
Fovea: OFF

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

Pupil Diameter:
Visual Acuity:
RX: +0.50 DS DC X

Date: 29-05-2017
Time: 10:21 AM
Age: 52





Total Deviation



Pattern Deviation

GHT
Within Normal Limits

VFI 99%

MD -0.71 dB
PSD 1.59 dB

:: < 5%
▒ < 2%
▓ < 1%
■ < 0.5%

Eye Surgery Associates
East Melbourne

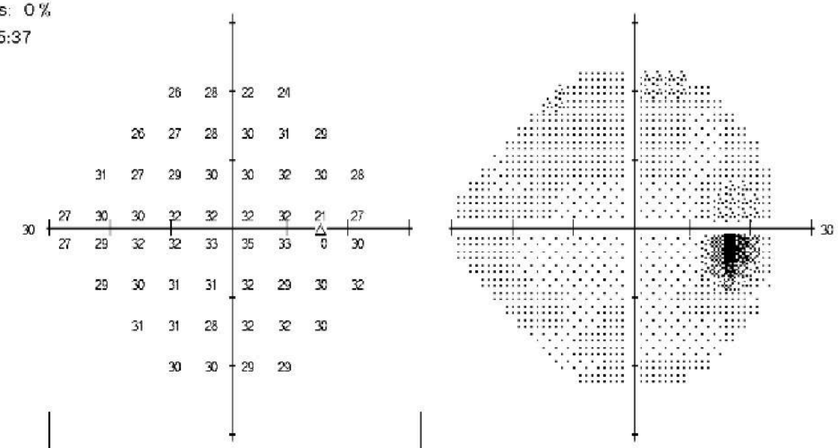
Fixation Monitor: Gaze/Blind Spot
Fixation Target: Central
Fixation Losses: 0/14
False POS Errors: 0 %
False NEG Errors: 0 %
Test Duration: 05:37

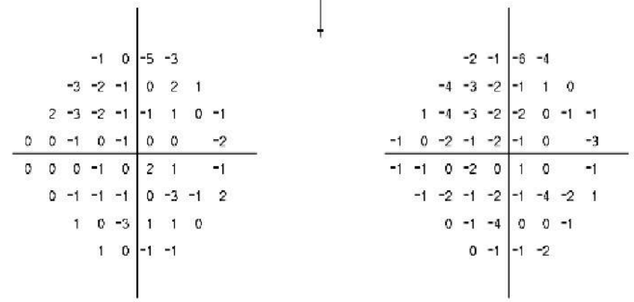
Fovea: OFF

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

Pupil Diameter: 6.1 mm
Visual Acuity:
RX: +2.25 DS -1.25 DC X 40

Date: 29-05-2017
Time: 10:14 AM
Age: 52





Total Deviation



Pattern Deviation

GHT
Within Normal Limits

VFI 99%

MD -0.47 dB
PSD 1.43 dB

:: < 5%
▒ < 2%
▓ < 1%
■ < 0.5%

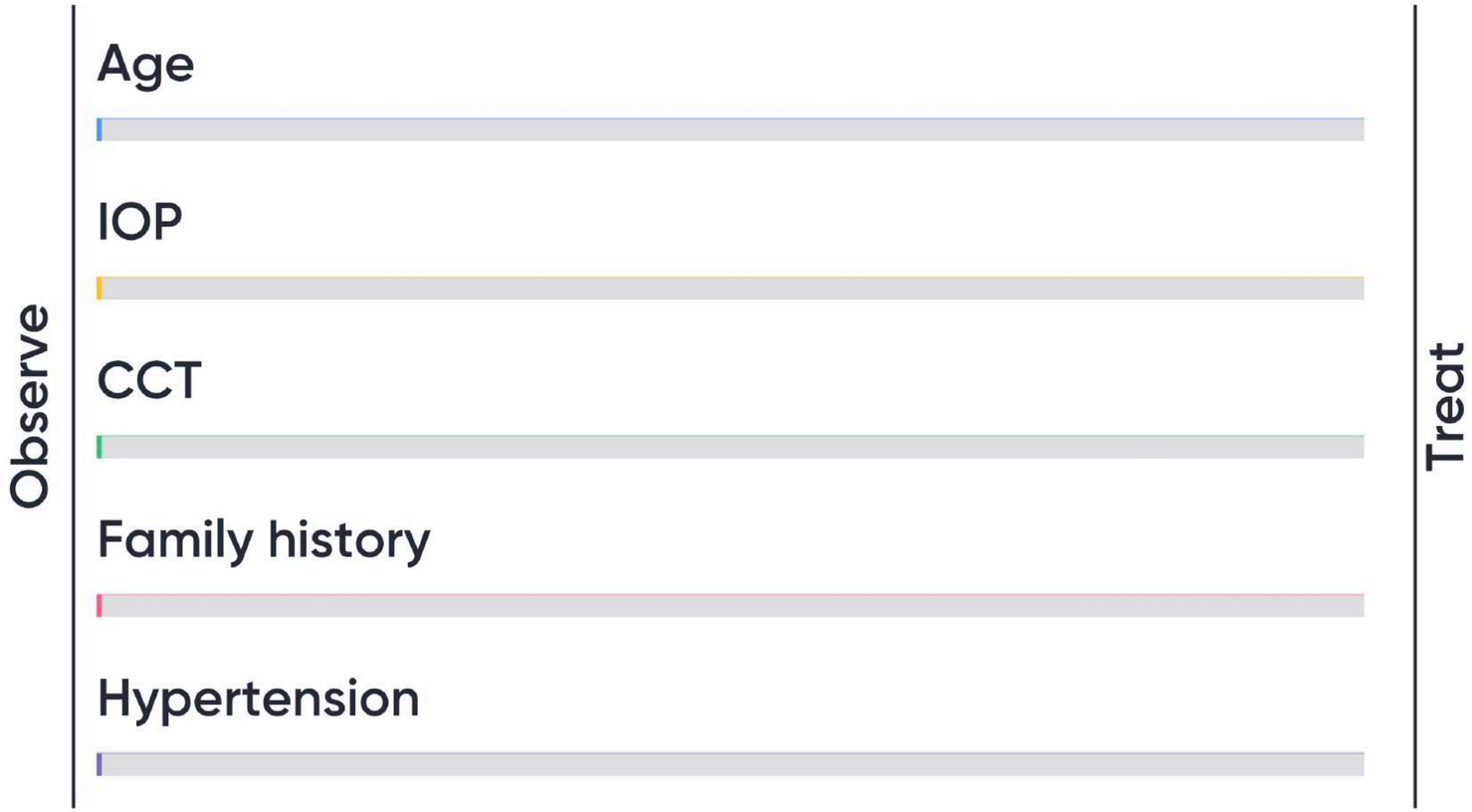
Eye Surgery Associates
East Melbourne

# How would you manage this patient?


Slide is not active Activate

0 0

# What factors influenced your decision?




Slide is not active Activate

0 0

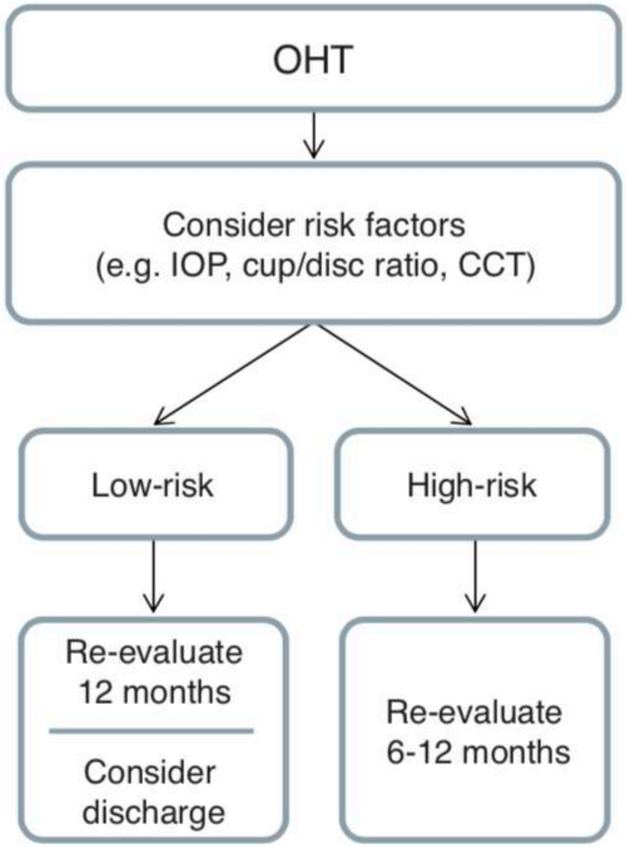
# Risk of conversion to glaucoma

| | |
|---|---|
| Age | • HR 1.2 per decade |
| Higher IOP | • HR 1.1 per mmHg |
| Large CDR | • HR 1.2 per 0.1 |
| Greater PSD | • HR 1.3 per 0.2 dB |
| Thinner CCT | • CCT < 555 microns associated with 3x risk of conversion |

# Managing ocular hypertension

| | |
|---|---|
| Recommendation | • Assess risk of conversion from ocular hypertension to glaucoma |
| Good practice | • Patients at low risk of conversion should be considered for monitoring |
| Good practice | • Patients at high risk of conversion should be considered for treatment |

# Managing ocular hypertension



# Case 3

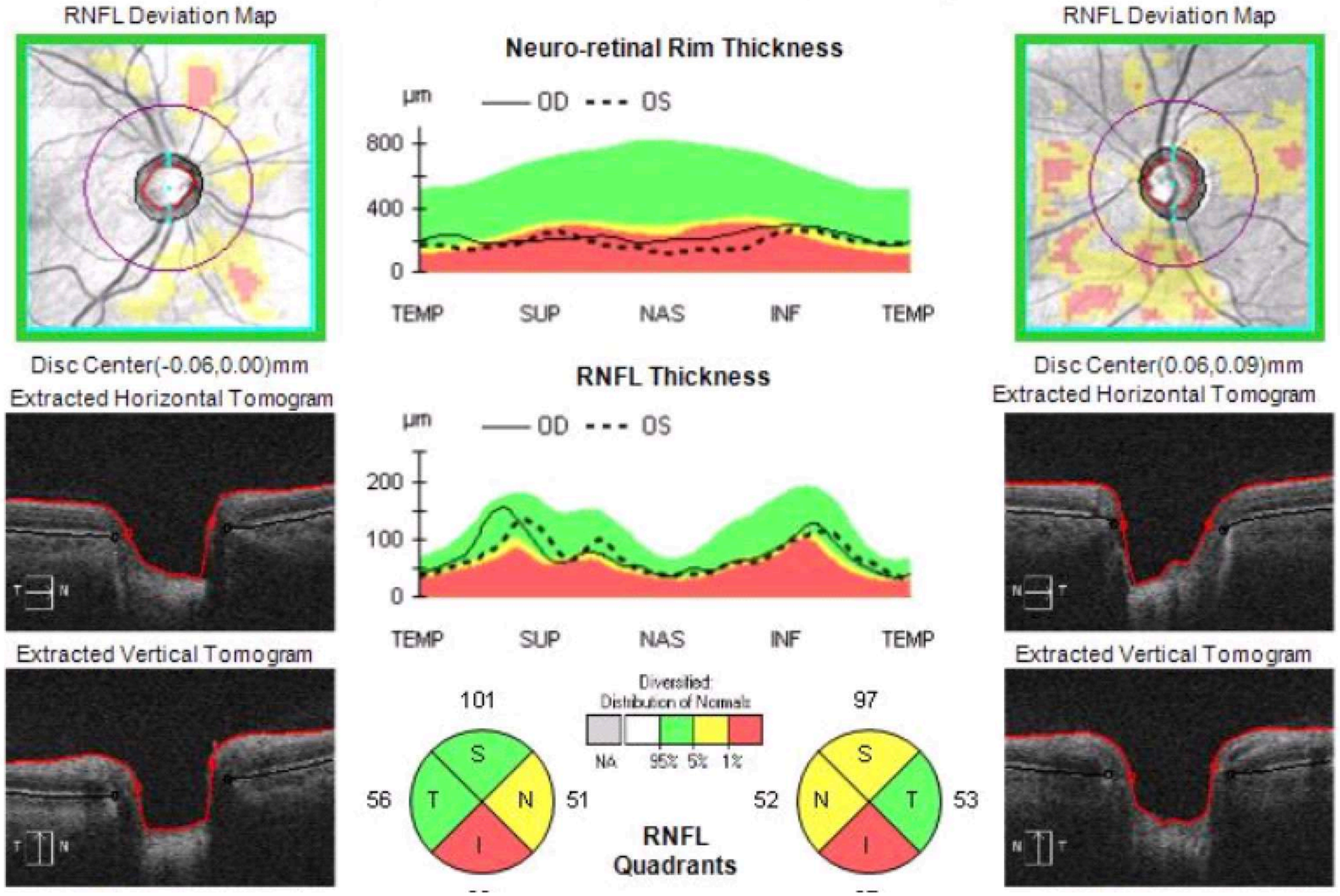
Pre-perimetric primary open-angle glaucoma

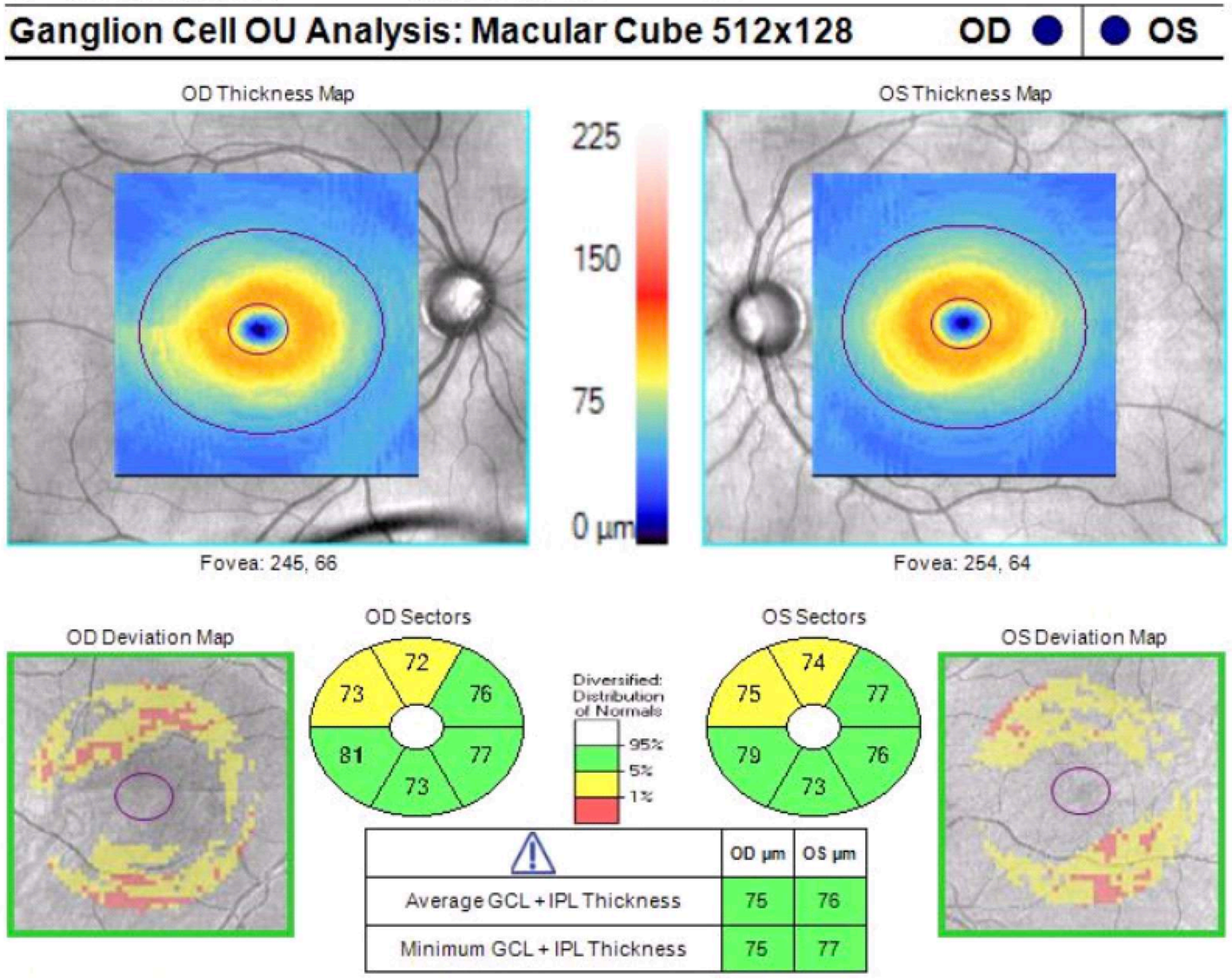
# Case 3

| | |
|---|---|
| Demographics | Male, 37 years old |
| History | Asymptomatic |
| Past ocular history | Ocular hypertension diagnosed 2015, IOPs 25; high myopia |
| Past medical history | Nil |
| Family history | Glaucoma – maternal and paternal grandparents |

# Case 3

| Right eye | Examination | Left eye |
| --- | --- | --- |
| 6/6 | Visual acuity | 6/6 |
| -7.75 | Refraction | -8.25 |
| 22 | IOP | 24 |
| 483 | CCT | 485 |
| Deep & quiet | AC | Deep & quiet |
| Grade 4 | Gonio | Grade 4 |
| No cataract | Lens | No cataract |
| 0.7 | Fundus | 0.7 |


RNFL Deviation Map
Neuro-retinal Rim Thickness
µm
OD
OS
800
400
0
TEMP
SUP
NAS
INF
TEMP
RNFL Deviation Map
Disc Center(-0.06,0.00)mm
Extracted Horizontal Tomogram
RNFL Thickness
µm
OD
OS
200
100
0
TEMP
SUP
NAS
INF
TEMP
Disc Center(0.06,0.09)mm
Extracted Horizontal Tomogram
Extracted Vertical Tomogram
Diversified Distribution of Normals
NA
95%
5%
1%
101
56
S
T
N
I
51
RNFL Quadrants
97
52
S
N
T
I
53
Extracted Vertical Tomogram


Ganglion Cell OU Analysis: Macular Cube 512x128
OD
OS
OD Thickness Map
OS Thickness Map
225
150
75
0 µm
Fovea: 245, 66
Fovea: 254, 64
OD Deviation Map
OD Sectors
OS Sectors
OS Deviation Map
72
73
76
81
77
73
74
75
77
79
76
73
Diversified Distribution of Normals
95%
5%
1%
OD µm
OS µm
Average GCL + IPL Thickness
75
76
Minimum GCL + IPL Thickness
75
77

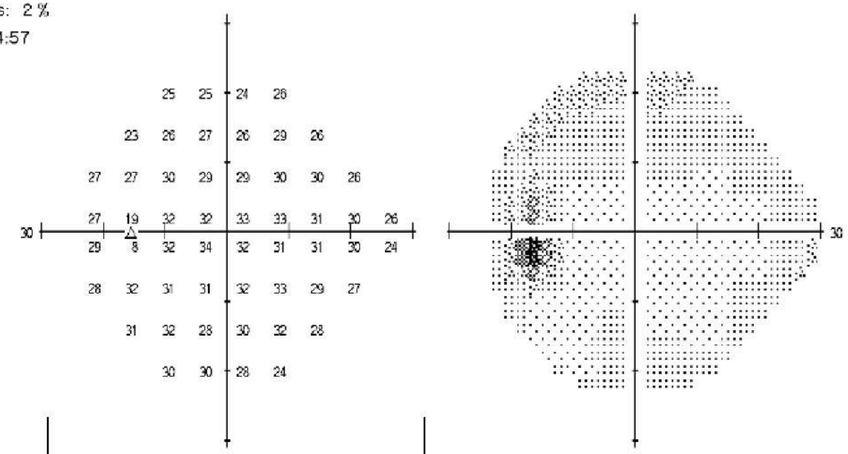
Fixation Monitor: Gaze/Blind Spot
Fixation Target: Central
Fixation Losses: 0/15
False POS Errors: 0 %
False NEG Errors: 2 %
Test Duration: 04:57

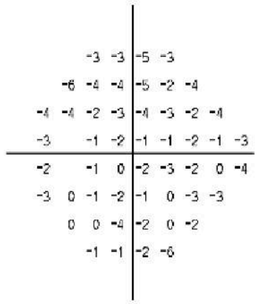
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard

Pupil Diameter: 5.7 mm
Visual Acuity:
RX: -5.50 DS DC X

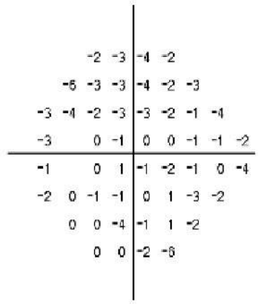
Date: 13-11-2017
Time: 9:01 AM
Age: 35

Fovea: OFF





Total Deviation

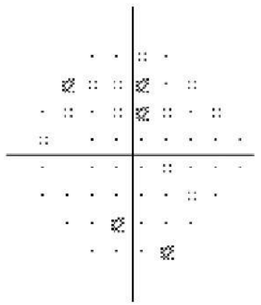


Pattern Deviation

GHT
Within Normal Limits

VFI 99%

MD -2.17 dB P < 5%
PSD 1.64 dB



:: < 5%
▒ < 2%
▓ < 1%
■ < 0.5%

Eye Surgery Associates
East Melbourne

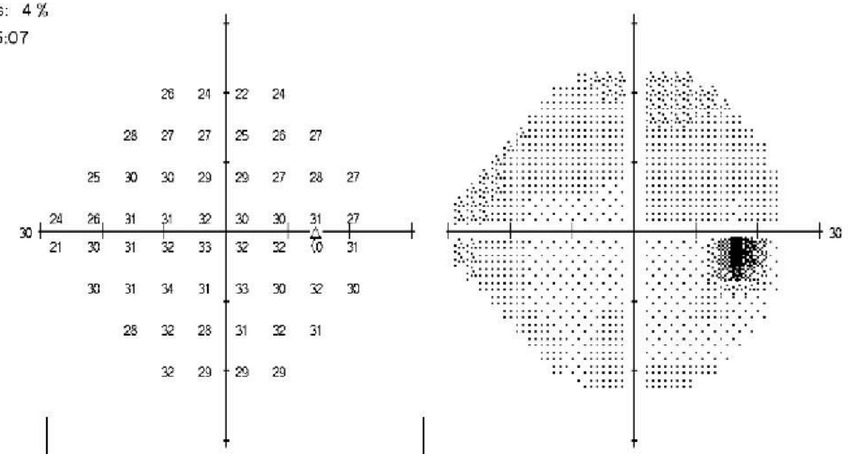
Fixation Monitor: Gaze/Blind Spot
Fixation Target: Central
Fixation Losses: 0/14
False POS Errors: 0 %
False NEG Errors: 4 %
Test Duration: 05:07

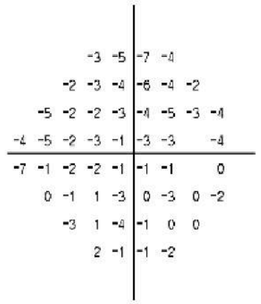
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard

Pupil Diameter: 8.6 mm
Visual Acuity:
RX: -4.50 DS -1.75 DC X 3

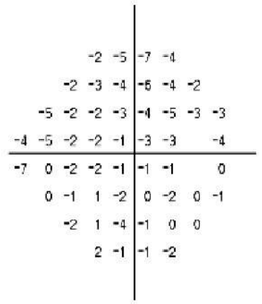
Date: 13-11-2017
Time: 8:53 AM
Age: 35

Fovea: OFF





Total Deviation

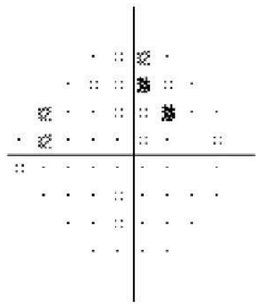


Pattern Deviation

GHT
Within Normal Limits

VFI 98%

MD -2.19 dB P < 5%
PSD 1.85 dB P < 10%



:: < 5%
▒ < 2%
▓ < 1%
■ < 0.5%

Eye Surgery Associates
East Melbourne

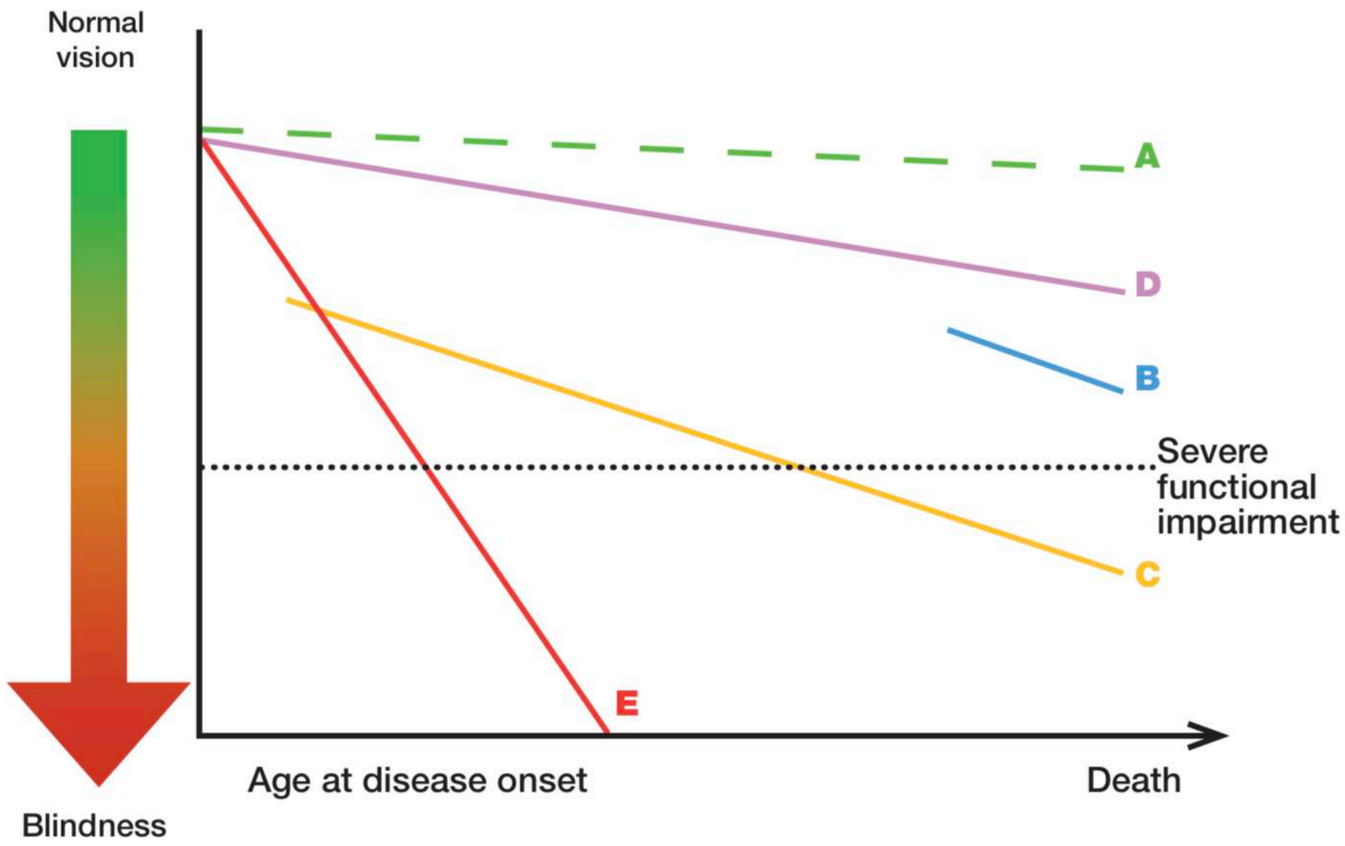
# What target pressure would you set?

| 0 | 0 | 0 | 0 |
| --- | --- | --- | --- |
| 21 mmHg or less | 18 mmHg or less | 15 mmHg or less | 12 mmHg or less |

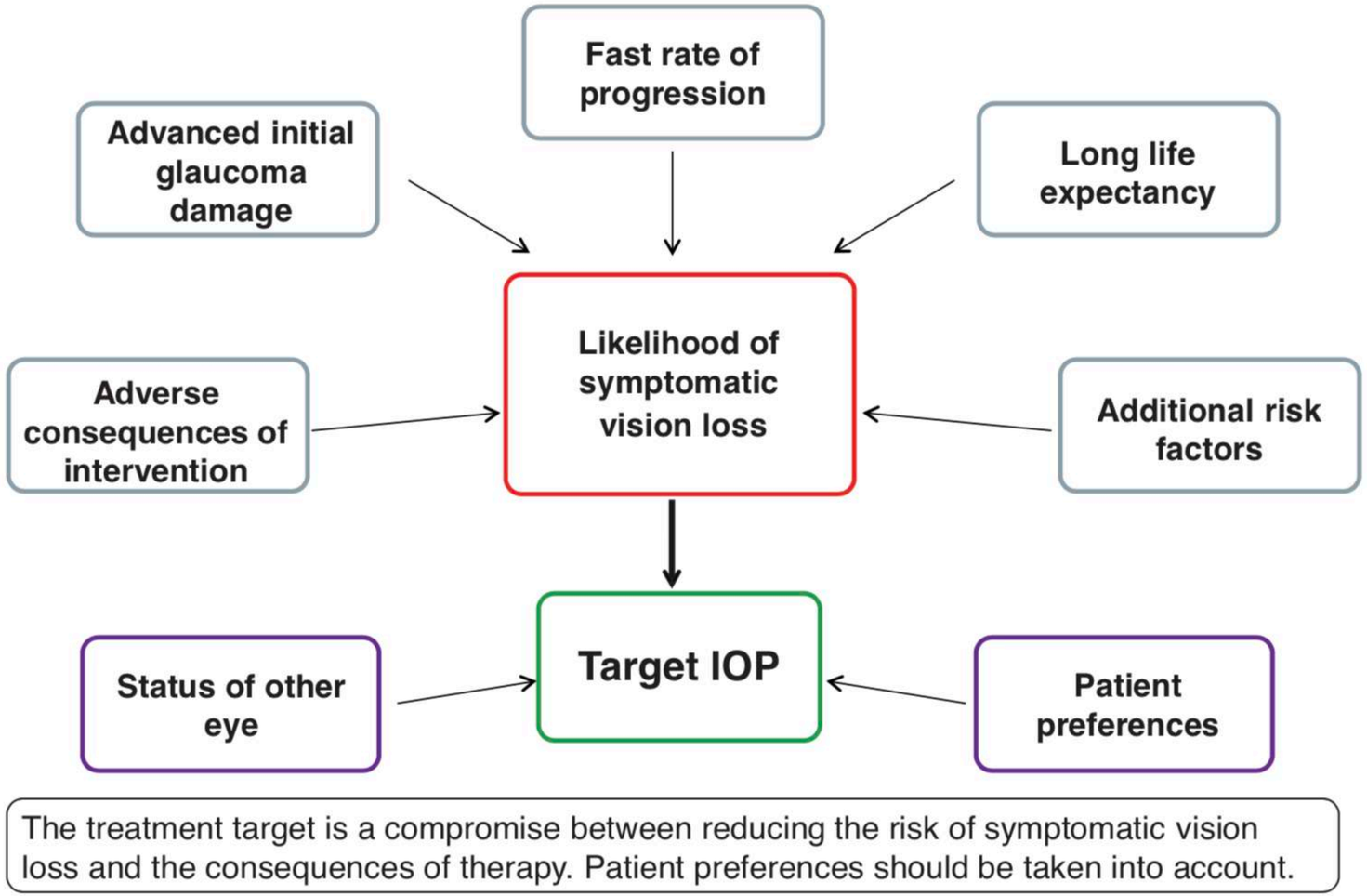
Slide is not active Activate

0 0

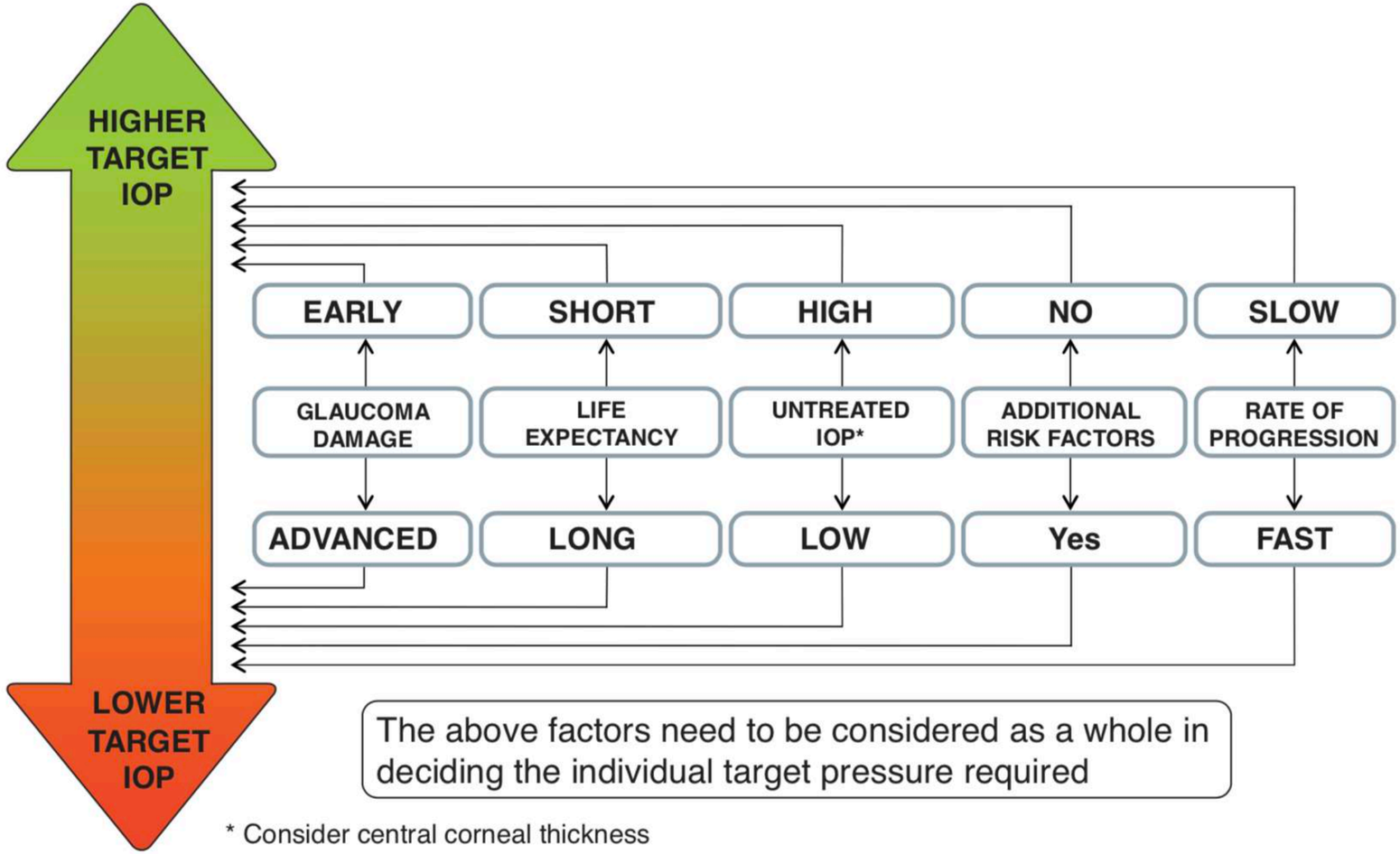
# General principals of glaucoma treatment



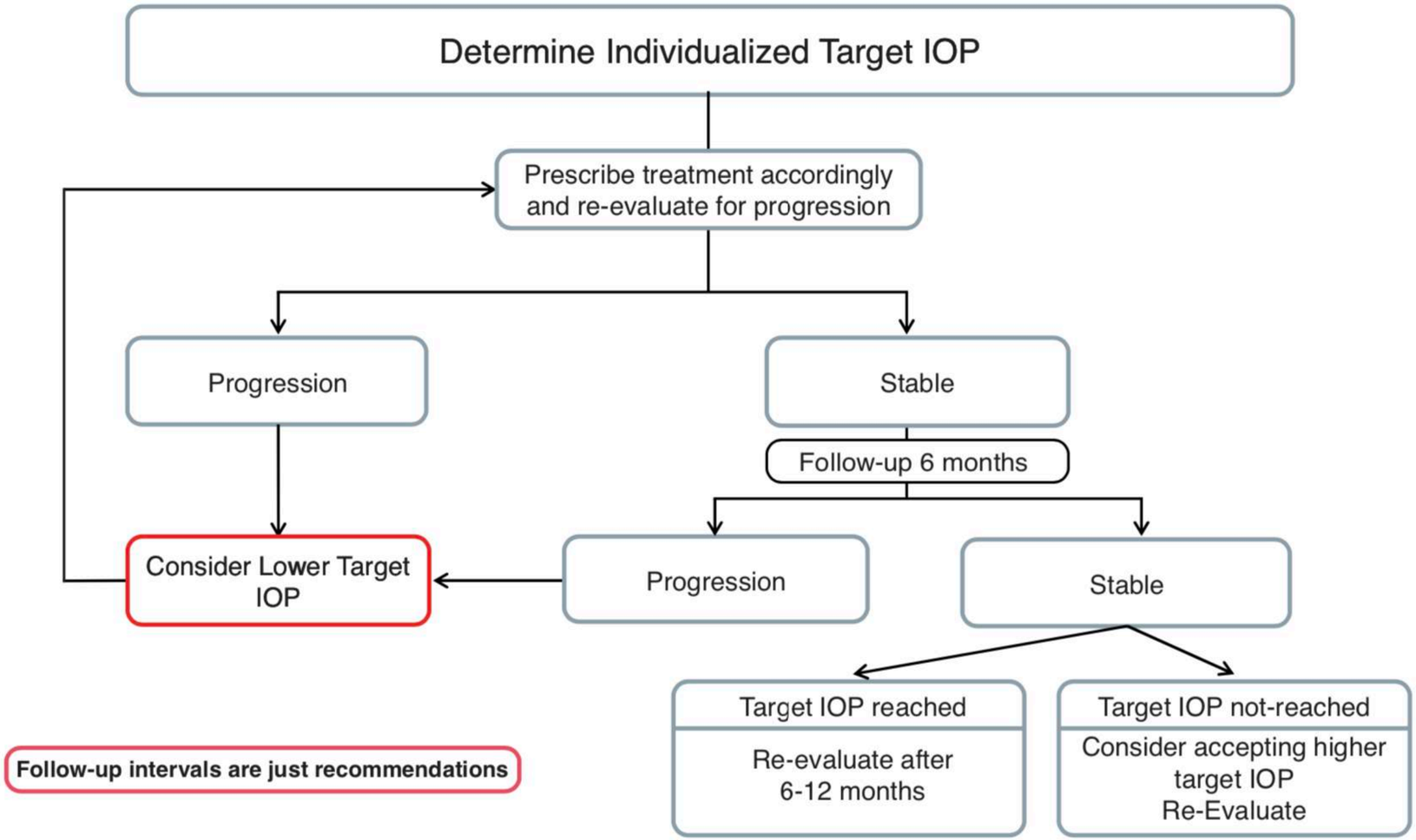
# Considerations for setting target IOP



# Setting the target IOP



# Revaluating the target IOP

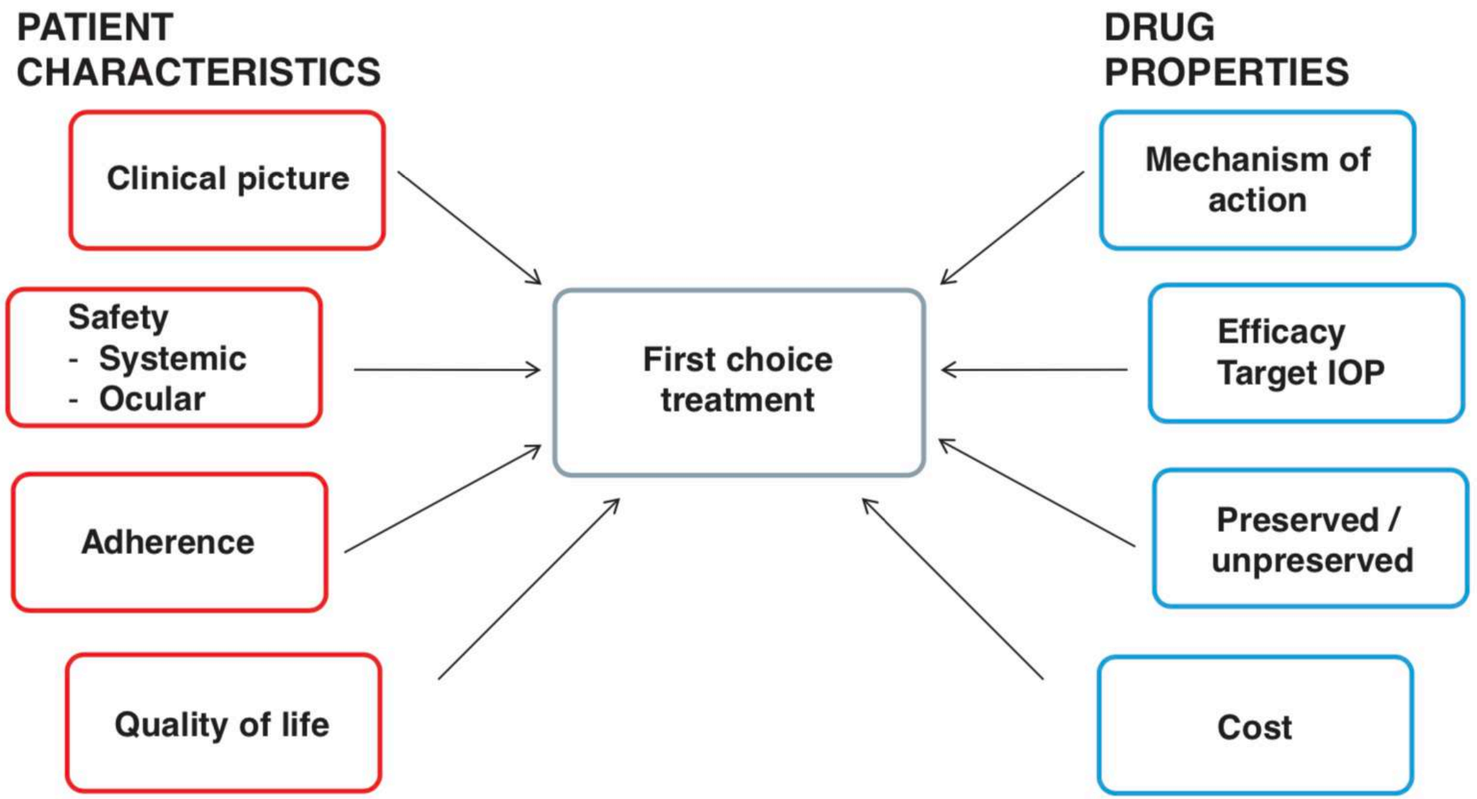


# How would you manage this patient?


Slide is not active Activate

0 0

# Considerations on treatment options




*A first choice treatment is considered a drug that the treating physician prefers to use as initial IOP lowering therapy as opposed to the first line treatment, which is one that has been approved by an official controlling body, like EMEA, FDA or National Agencies.*

# Evidence

# LiGHT Trial

| | |
|---|---|
| Study | • Selective laser trabeculoplasty versus eye drops for first-line treatment of ocular hypertension and glaucoma (LiGHT) |
| Study design | • Observer-masked randomized controlled trial |
| Participants | • Treatment naïve patients with ocular hypertension or open-angle glaucoma |
| Intervention and control | • Selective laser trabeculoplasty versus glaucoma eye drops |
| Results | • Patients treated with laser were more likely to be drop-free (74% vs 100%), at target (93% vs 91%), or require glaucoma surgery (0 vs 11 patients) |

Gazzard, Gus, et al. "Selective laser trabeculoplasty versus eye drops for first-line treatment of ocular hypertension and glaucoma (LiGHT): a multicentre randomised controlled trial." *The Lancet* (2019)

# Case 4

Primary angle closure suspect

# Case 4

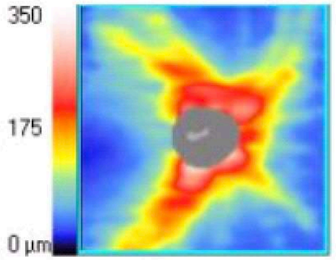
| | |
|---|---|
| Demographics | Female, 54 years old |
| History | Asymptomatic |
| Past ocular history | Hyperopia |
| Past medical history | Type 2 diabetes mellitus |
| Family history | Nil |

# Case 4

| Right eye | Examination | Left eye |
| --- | --- | --- |
| 6/4.8 | Visual acuity | 6/4.8 |
| +3.75 | Refraction | +3.75 |
| 17 | IOP | 16 |
| 591 | CCT | 596 |
| Shallow & quiet | AC | Shallow & quiet |
| Grade 1, no PAS | Gonio | Grade 1, no PAS |
| No cataract | Lens | No cataract |
| 0.2 | Fundus | 0.2 |

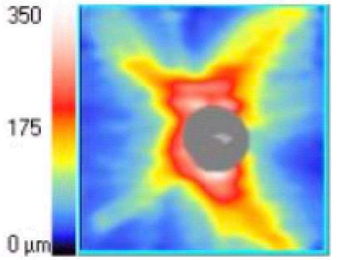
## ONH and RNFL OU Analysis:Optic Disc Cube 200x200 OD ● | ● OS

RNFL Thickness Map

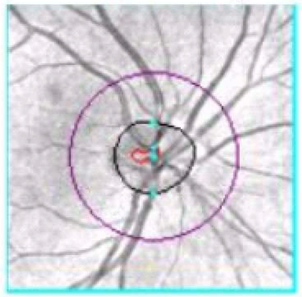



| | OD | OS |
|---|---|---|
| Average RNFL Thickness | 115 µm | 113 µm |
| RNFL Symmetry | 84% | |
| Rim Area | 1.79 mm² | 1.95 mm² |
| Disc Area | 1.90 mm² | 2.03 mm² |
| Average C/D Ratio | 0.24 | 0.20 |
| Vertical C/D Ratio | 0.14 | 0.17 |
| Cup Volume | 0.009 mm³ | 0.001 mm³ |

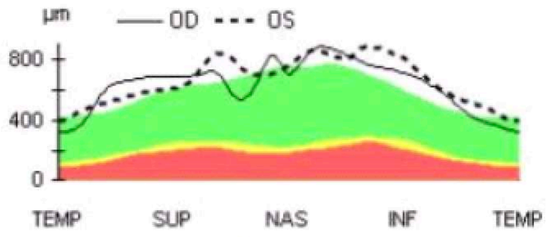
RNFL Thickness Map



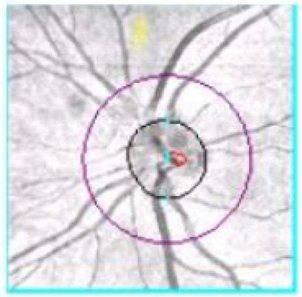

RNFL Deviation Map



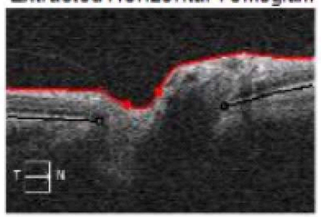
Neuro-retinal Rim Thickness



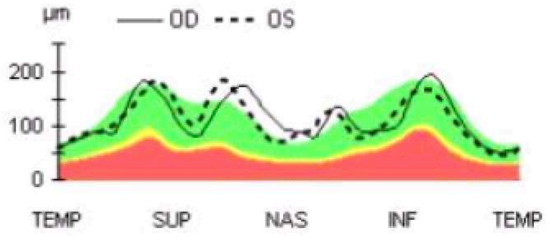

RNFL Deviation Map



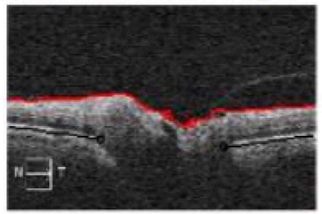
Disc Center(0.03,-0.15)mm
Extracted Horizontal Tomogram



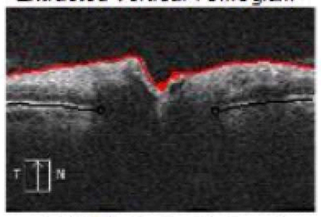
RNFL Thickness

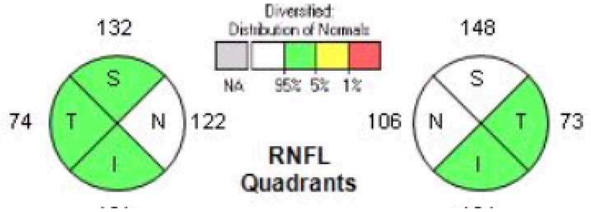



Disc Center(0.30,-0.21)mm
Extracted Horizontal Tomogram

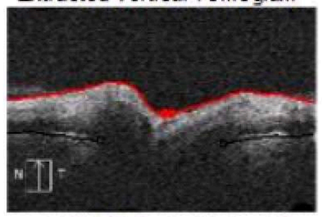


Extracted Vertical Tomogram



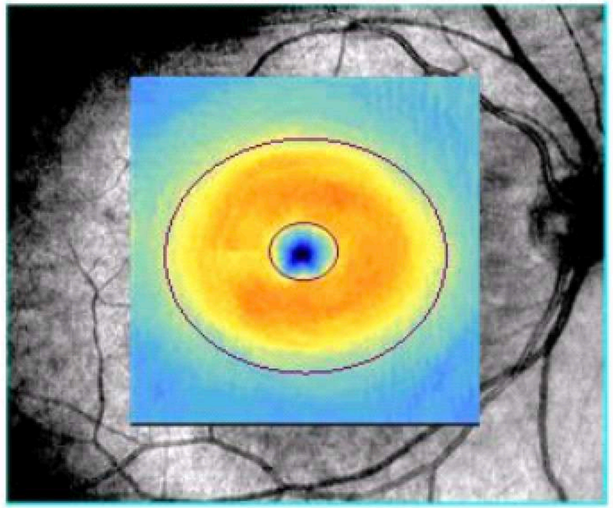



Extracted Vertical Tomogram



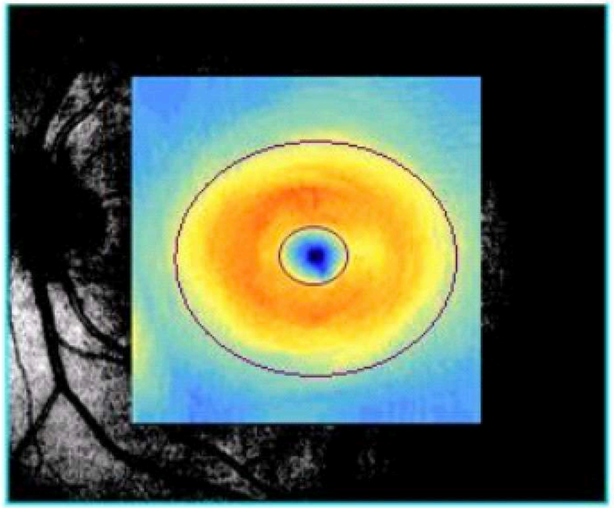
## Ganglion Cell OU Analysis: Macular Cube 512x128 OD ● | ● OS

OD Thickness Map



225
150
75
0 µm

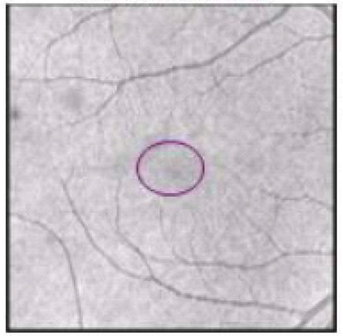
OS Thickness Map



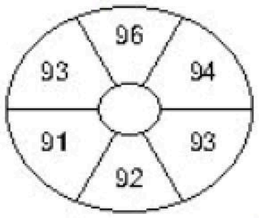
Fovea: 255, 65

Fovea: 268, 66

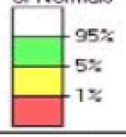
OD Deviation Map



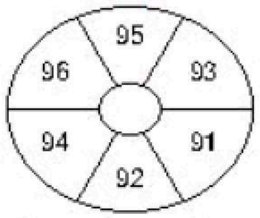
OD Sectors



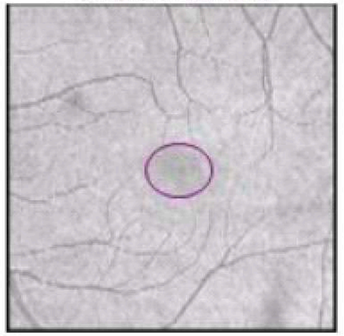

Diversified Distribution of Normals




OS Sectors




OS Deviation Map



| | OD µm | OS µm |
|---|---|---|
| Average GCL + IPL Thickness | 93 | 94 |
| Minimum GCL + IPL Thickness | 90 | 90 |

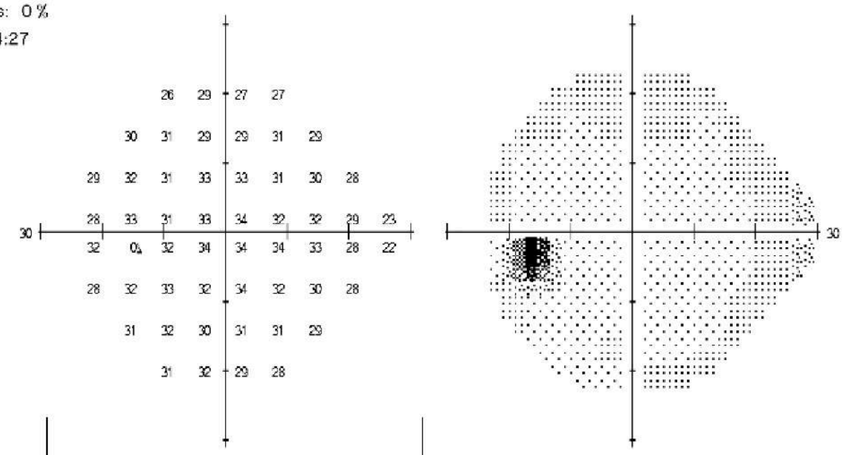
Fixation Monitor: Blind Spot
Fixation Target: Central
Fixation Losses: 0/14
False POS Errors: 0 %
False NEG Errors: 0 %
Test Duration: 04:27

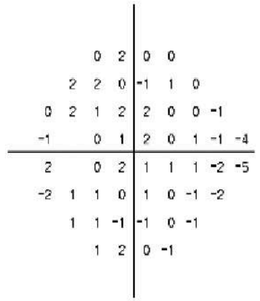
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard

Pupil Diameter:
Visual Acuity:
RX: +5.75 DS DC X

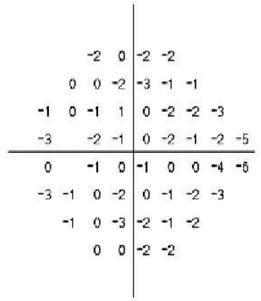
Date: 20-05-2019
Time: 4:51 PM
Age: 54

Fovea: OFF





Total Deviation



Pattern Deviation

GHT
Within Normal Limits

VFI 100%

MD +0.35 dB
PSD 1.29 dB

:: < 5%
▒ < 2%
▓ < 1%
■ < 0.5%

Eye Surgery Associates
East Melbourne

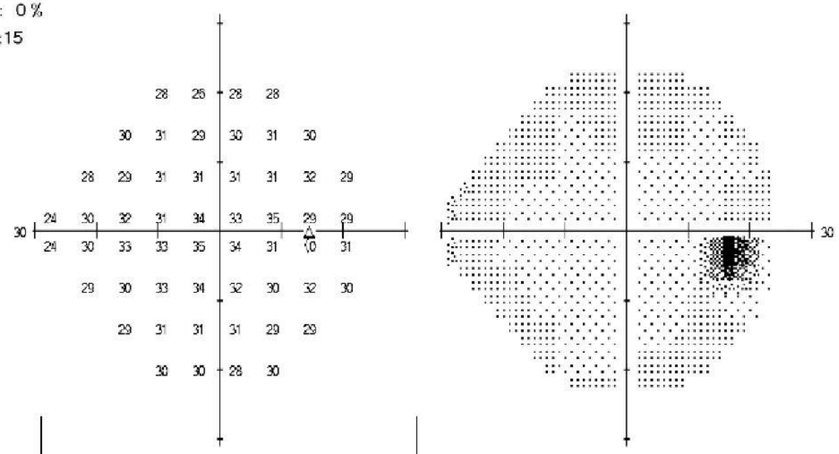
Fixation Monitor: Gaze/Blind Spot
Fixation Target: Central
Fixation Losses: 0/13
False POS Errors: 0 %
False NEG Errors: 0 %
Test Duration: 04:15

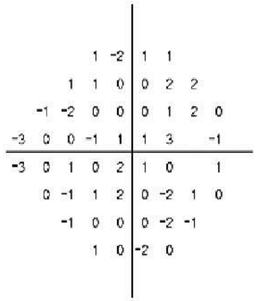
Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard

Pupil Diameter: 5.3 mm
Visual Acuity:
RX: +6.25 DS -1.25 DC X 13

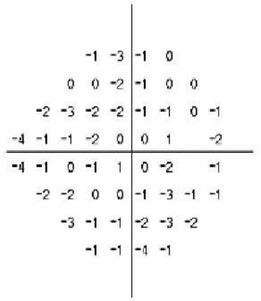
Date: 20-05-2019
Time: 4:45 PM
Age: 54

Fovea: OFF





Total Deviation



Pattern Deviation

GHT
Within Normal Limits

VFI 100%

MD +0.24 dB
PSD 1.23 dB

:: < 5%
▒ < 2%
▓ < 1%
■ < 0.5%

Eye Surgery Associates
East Melbourne

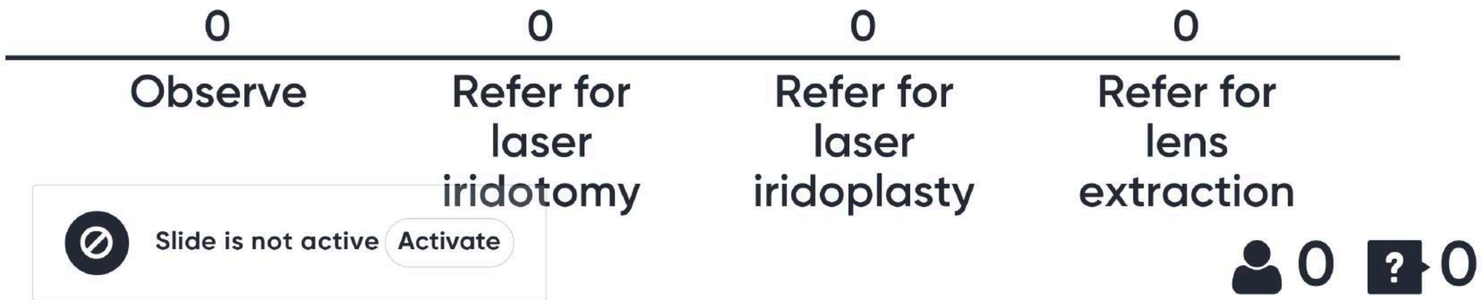
# What is the diagnosis?

| 0 | 0 | 0 | 0 |
|---|---|---|---|
| Normal | Primary angle closure suspect | Primary angle closure | Primary angle closure glaucoma |

Slide is not active Activate

0 0

# How would you manage this patient?



# Evidence

| | |
|---|---|
| Study | • Laser peripheral iridotomy for the prevention of angle closure: a single-centre, randomised controlled trial |
| Study design | • Randomized controlled trial |
| Participants | • Bilateral primary angle closure suspects aged 50-70 years |
| Intervention and control | • Laser peripheral iridotomy in one eye selected at random |
| Results | • Laser peripheral iridotomy reduced the risk of angle-closure events, however the incidence of angle-closure was very low |

# ZAP Trial

He, Mingguang, et al. "Laser peripheral iridotomy for the prevention of angle closure: a single-centre, randomised controlled trial." *The Lancet* (2019).

# Case 5

Primary angle closure glaucoma

# Case 5

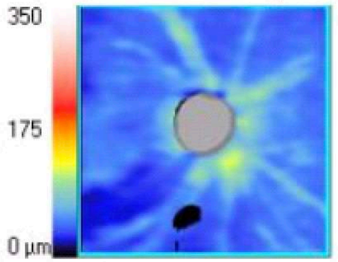
| | |
|---|---|
| Demographics | Male, 63 years old |
| History | Concerned about surgery in better eye |
| Past ocular history | Bilateral primary angle closure glaucoma, complicated right trabeculectomy 2011; maximum medical therapy left eye |
| Past medical history | Asthma |
| Family history | Glaucoma - brother |

# Case 5

| Right eye | Examination | Left eye |
| --- | --- | --- |
| 6/15 | Visual acuity | 6/6 |
| Plano | Refraction | +1.5 |
| 14 | IOP | 25 |
| 498 | CCT | 498 |
| Shallow & quiet | AC | Shallow & quiet |
| Grade 1, PAS | Gonio | Grade 1, PAS |
| No cataract | Lens | No cataract |
| 0.85 | Fundus | 0.75 |

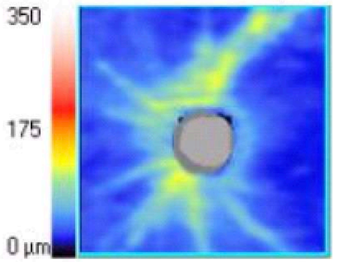
## ONH and RNFL OU Analysis:Optic Disc Cube 200x200 OD ● | ● OS

RNFL Thickness Map

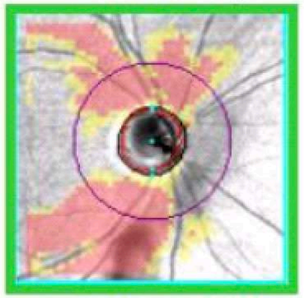



| | OD | OS |
|---|---|---|
| Average RNFL Thickness | 51 µm | 60 µm |
| RNFL Symmetry | 49% | |
| Rim Area | 0.40 mm² | 0.60 mm² |
| Disc Area | 1.76 mm² | 1.80 mm² |
| Average C/D Ratio | 0.88 | 0.82 |
| Vertical C/D Ratio | 0.86 | 0.75 |
| Cup Volume | 0.867 mm³ | 0.565 mm³ |

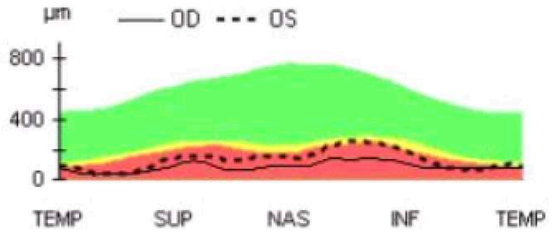
RNFL Thickness Map



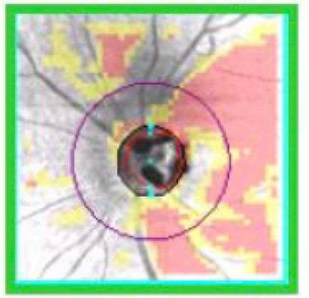

RNFL Deviation Map



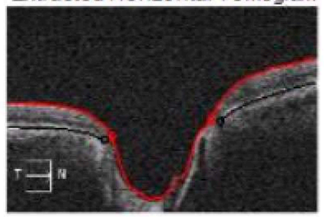
Neuro-retinal Rim Thickness



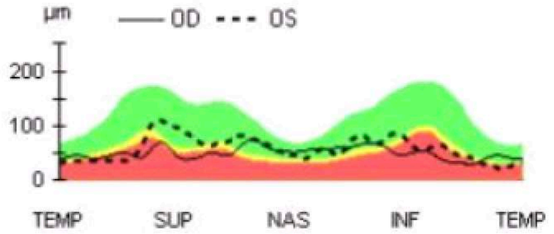

RNFL Deviation Map



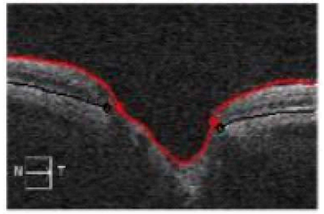
Disc Center(0.00,0.18)mm
Extracted Horizontal Tomogram



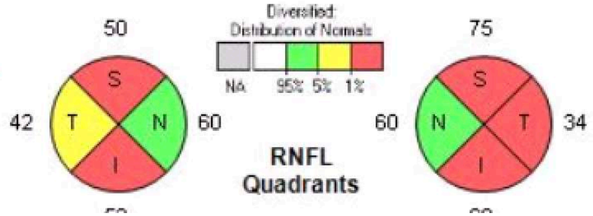
RNFL Thickness



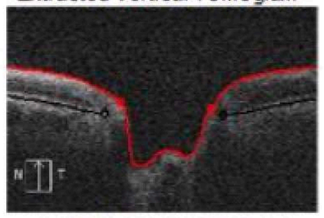

Disc Center(-0.03,-0.27)mm
Extracted Horizontal Tomogram



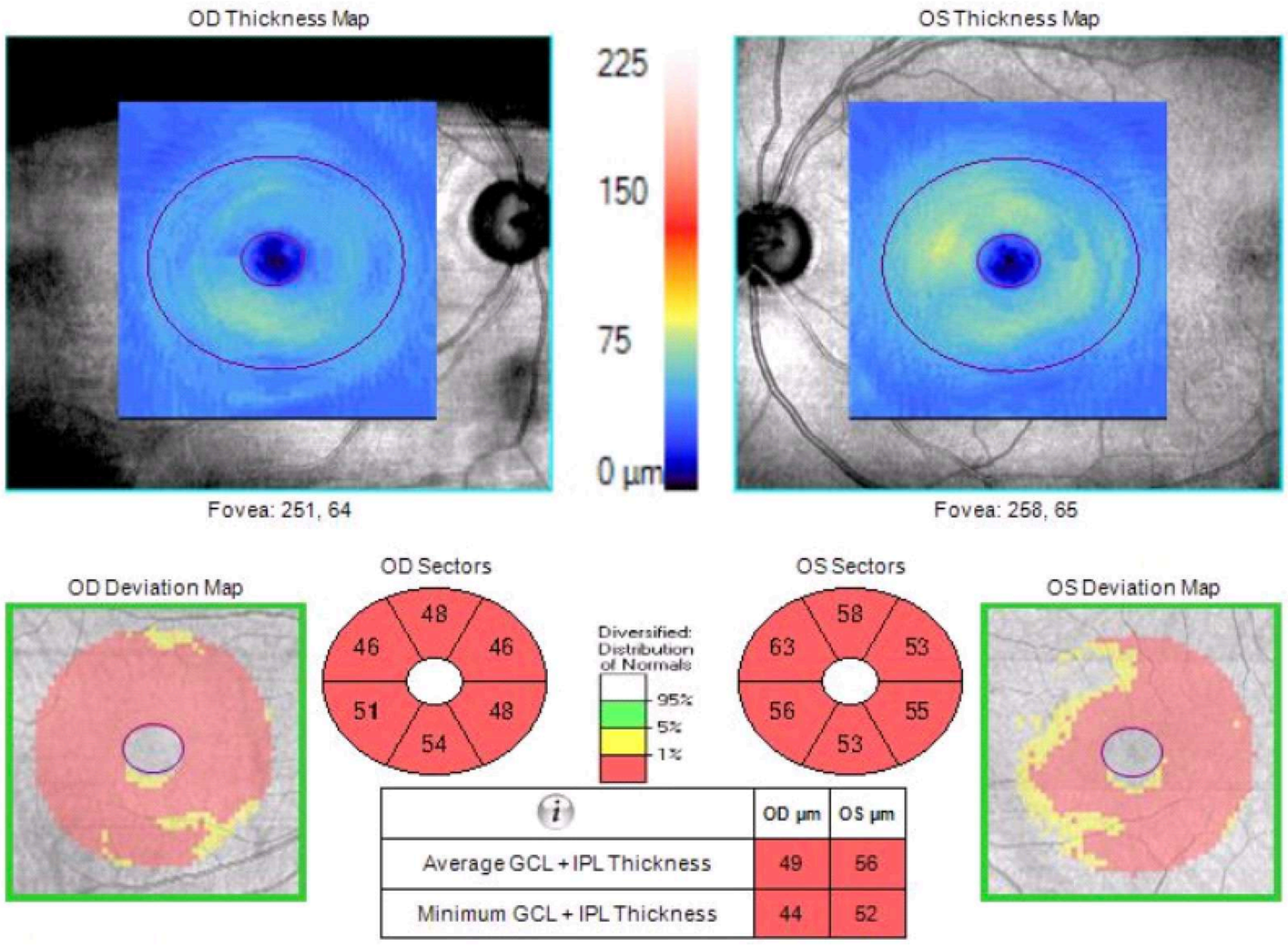
Extracted Vertical Tomogram




Extracted Vertical Tomogram



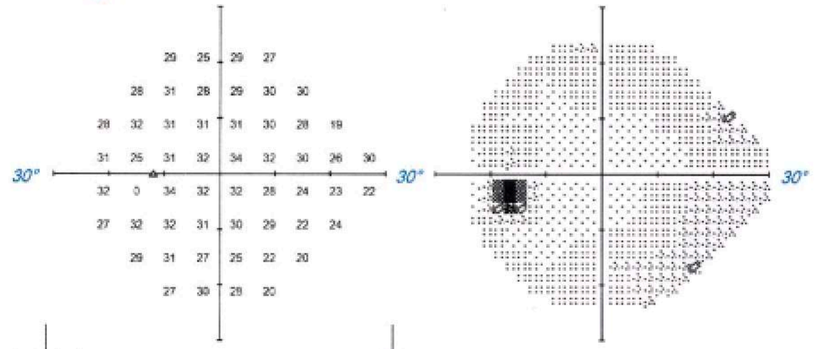
## Ganglion Cell OU Analysis: Macular Cube 512x128 OD ● ● OS

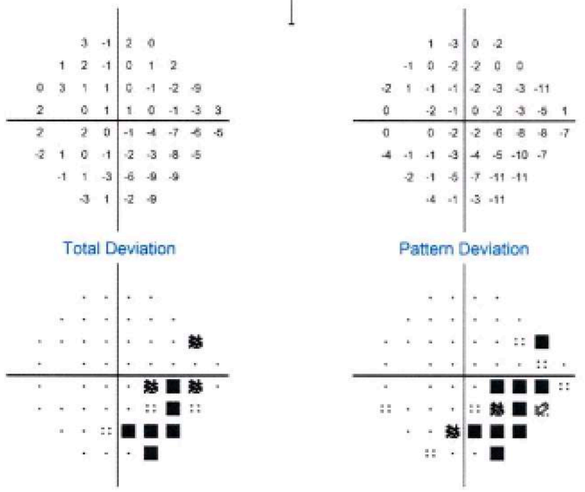



| i | OD µm | OS µm |
|---|---|---|
| Average GCL + IPL Thickness | 49 | 56 |
| Minimum GCL + IPL Thickness | 44 | 52 |

## OS Single Field Analysis — Central 24-2 Threshold Test

| | | | | | |
|---|---|---|---|---|---|
| Fixation Monitor: | Blind Spot | Stimulus: | III, White | Date: | Feb 22, 2018 |
| Fixation Target: | Central | Background: | 31.5 asb | Time: | 4:32 PM |
| Fixation Losses: | 0/12 | Strategy: | SITA-Standard | Age: | 62 |
| False POS Errors: | 3% | Pupil Diameter: | | | |
| False NEG Errors: | 0% | Visual Acuity: | | | |
| Test Duration: | 05:03 | Rx: | +4.75 DS | | |
| Fovea: | Off | | | | |




GHT: Outside Normal Limits

VFI: 96%

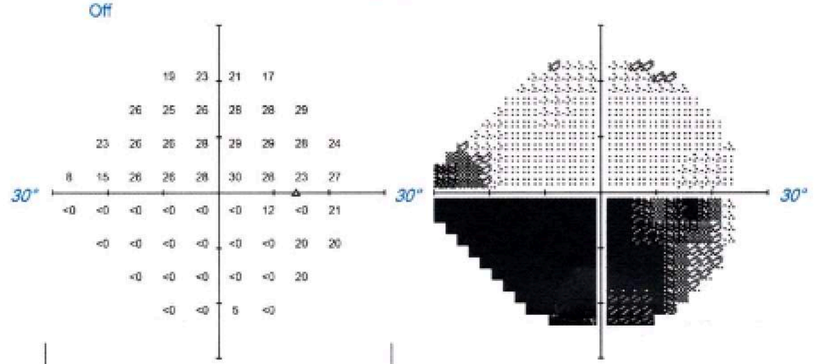
MD: -1.66 dB

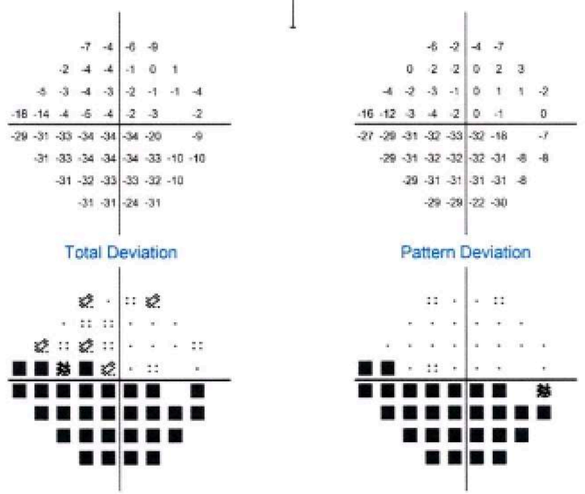
PSD: 3.52 dB P < 1%

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

## OD Single Field Analysis — Central 24-2 Threshold Test

| | | | | | |
|---|---|---|---|---|---|
| Fixation Monitor: | Blind Spot | Stimulus: | III, White | Date: | Feb 22, 2018 |
| Fixation Target: | Central | Background: | 31.5 asb | Time: | 4:25 PM |
| Fixation Losses: | 1/15 | Strategy: | SITA-Standard | Age: | 62 |
| False POS Errors: | 3% | Pupil Diameter: | | | |
| False NEG Errors: | 6% | Visual Acuity: | | | |
| Test Duration: | 06:15 | Rx: | +2.25 DS | | |
| Fovea: | Off | | | | |




GHT: Outside Normal Limits

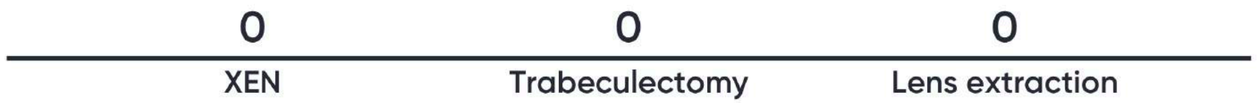
VFI: 52%

MD: -17.98 dB P < 0.5%

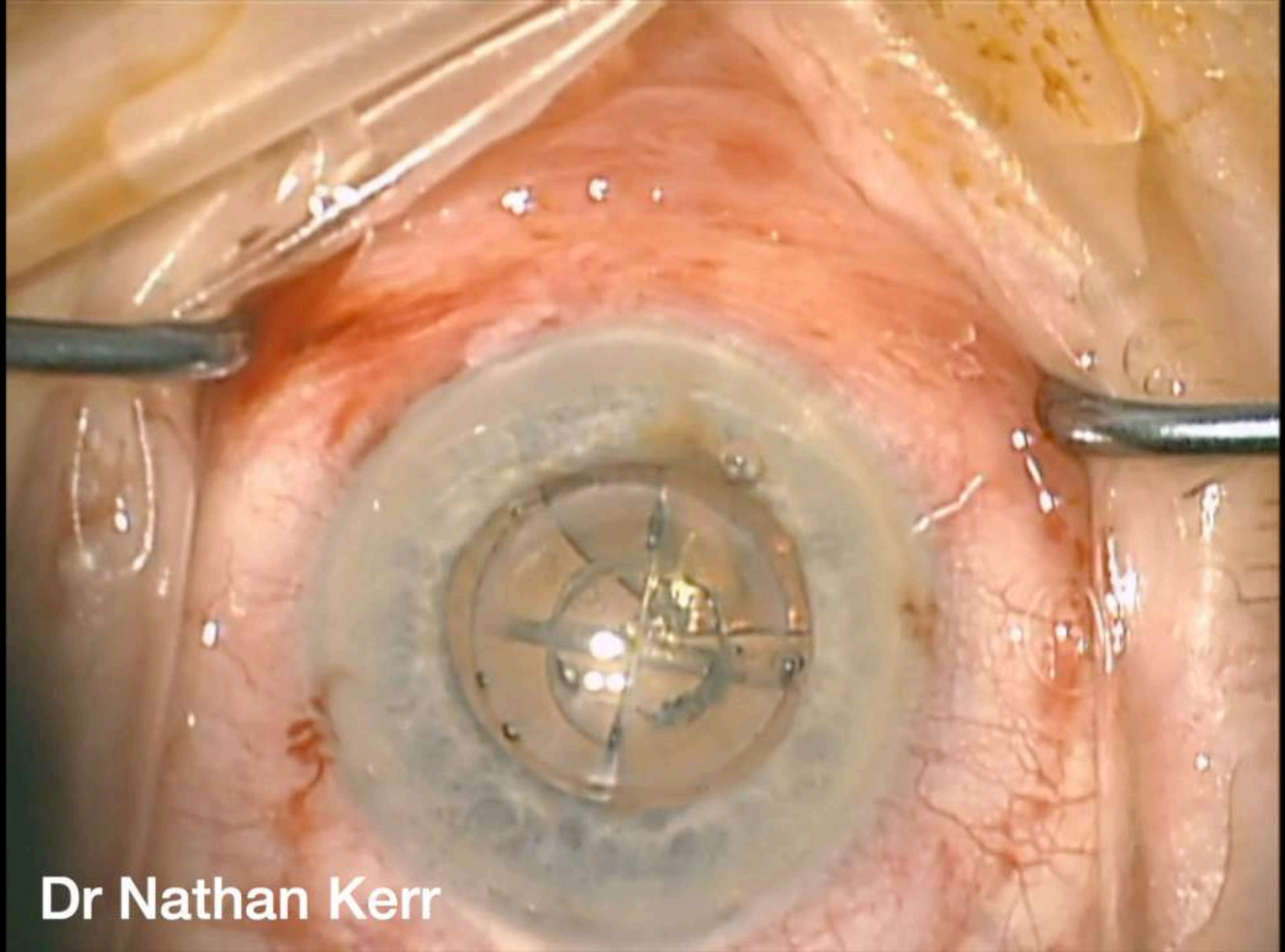
PSD: 15.20 dB P < 0.5%

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

# What surgery would you discuss with the patient?




0 0


Dr Nathan Kerr

# Evidence

# EAGLE Trial

| | |
|---|---|
| Study | • Effectiveness of early lens extraction for the treatment of primary angle-closure glaucoma (EAGLE): a randomised controlled trial |
| Study design | • Randomized controlled trial |
| Participants | • Primary angle-closure with an IOP of 30 mmHg or more or primary angle-closure glaucoma |
| Intervention and control | • Laser peripheral iridotomy or clear lens extraction |
| Results | • Lens extraction was more efficacious and cost-effective |

Azuara-Blanco, Augusto, et al. "Effectiveness of early lens extraction for the treatment of primary angle-closure glaucoma (EAGLE): a randomised controlled trial." *The Lancet*388.10052 (2016): 1389-1397.