

# NATIONAL HIGH-TECH EYE CENTER

Center of Excellence in Ophthalmology

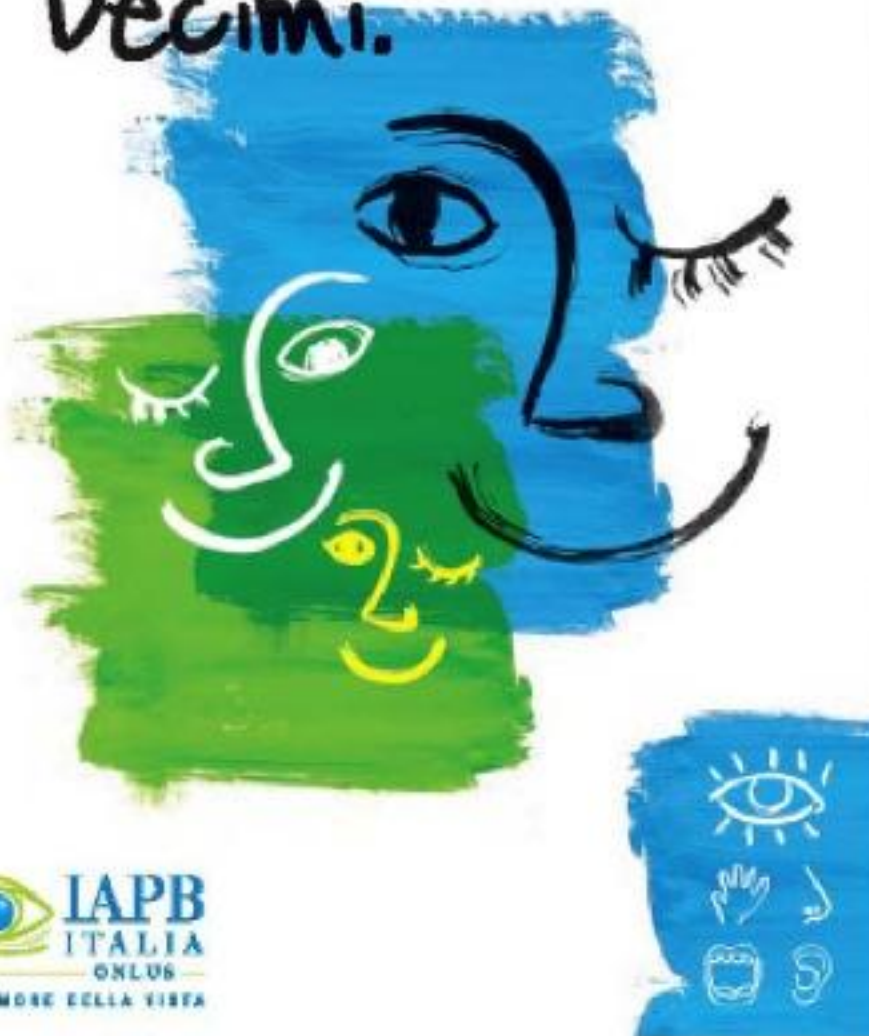
University G. d'Annunzio of Chieti-Pescara

Head: Prof. L. Mastropasqua



Site of Excellence

Tutti i bambini  
si meritano 10.  
Decimi.



L. Mastropasqua

Roma. October 10, 2013



# AMBLYOPIA: definition

**AMBLYOPIA** is **MONOCULAR** diminished vision that results from **INADEQUATE VISUAL EXPERIENCE** during the first years of life **with no other ocular abnormality.**

(Birch EE, 2013)

**AMBLYOPIA IS THE MOST COMMON CAUSE OF MONOCULAR VISUAL LOSS IN CHILDREN**



# THEORY of AMBLYOPIA

The predominant theory is that amblyopia results when there is

a **MISMATCH BETWEEN THE IMAGES TO EACH EYE; ONE EYE IS FAVORED WHILE THE INFORMATION FROM THE OTHER EYE IS SUPPRESSED**

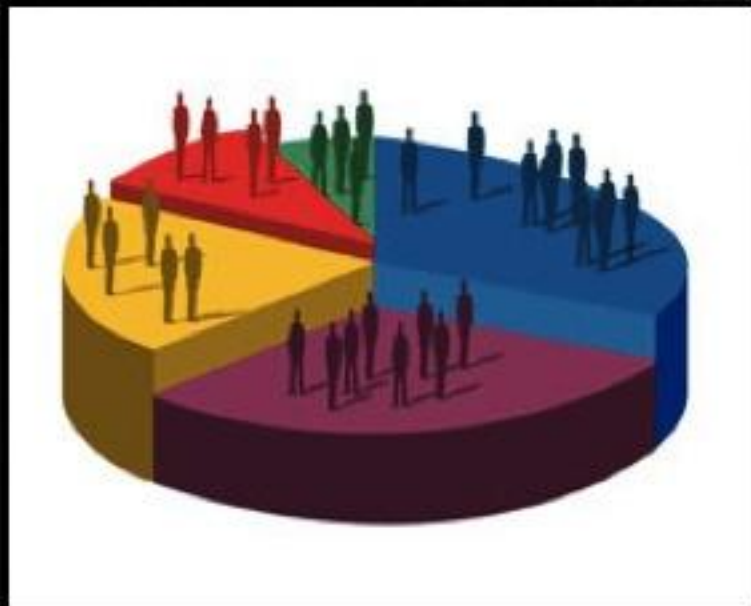
(Harrad et al., 1996).



**PRIMARY VISUAL CORTEX IS NOT STIMULATED by effective visual stimuli**

# AMBLYOPIA: epidemiology

Amblyopia affects  
**1.3% - 3.6%**  
of children



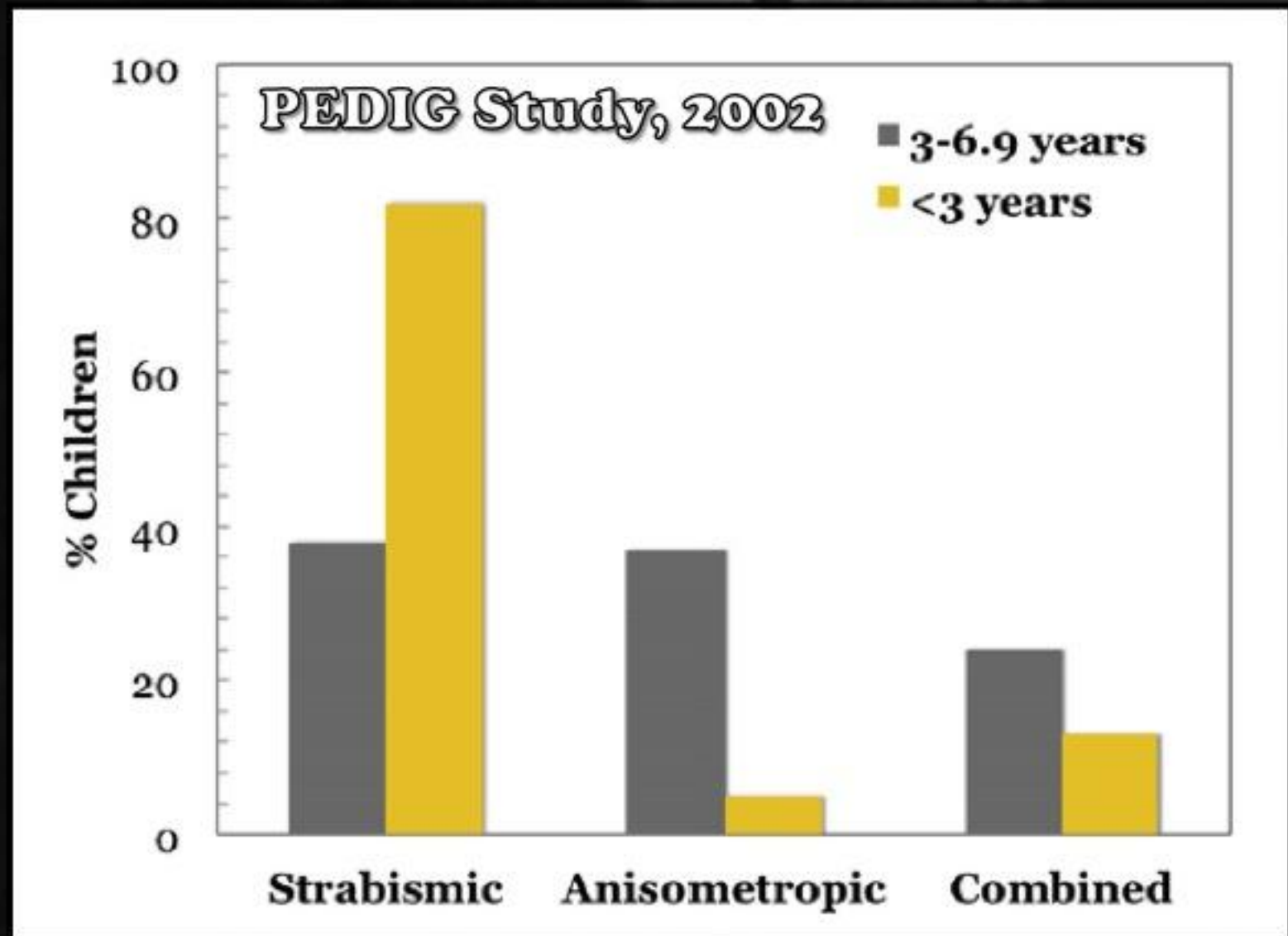
With 625 million children under the age of 5 years worldwide, more than **15 MILLION MAY HAVE AMBLYOPIA**, and more than **HALF OF THEM WILL NOT BE IDENTIFIED** before they reach school age.

(Wu and Hunter, 2006)



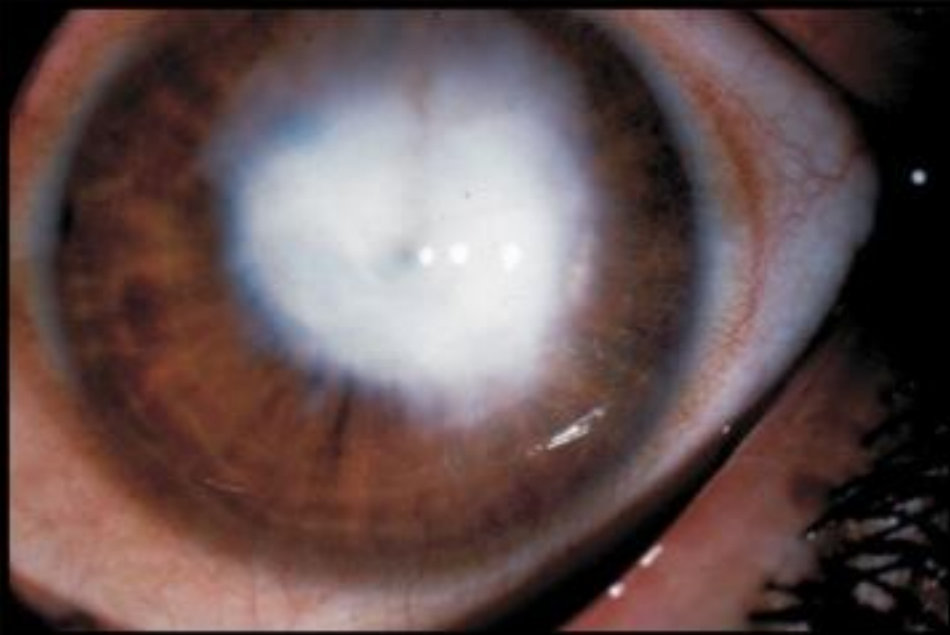
# CAUSES of AMBLYOPIA

The factors responsible for amblyopia vary with age



# CAUSES of AMBLYOPIA: DEPRIVATION

## Corneal OPACITY



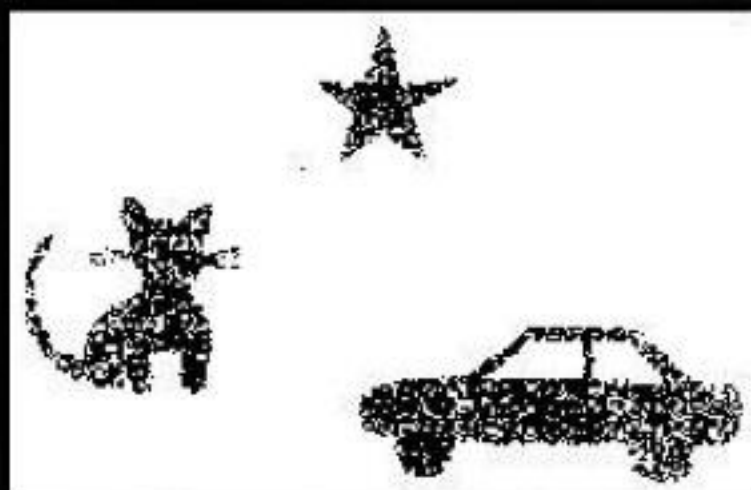
## CATARACT



## PTOSYS

# DIAGNOSIS of amblyopia

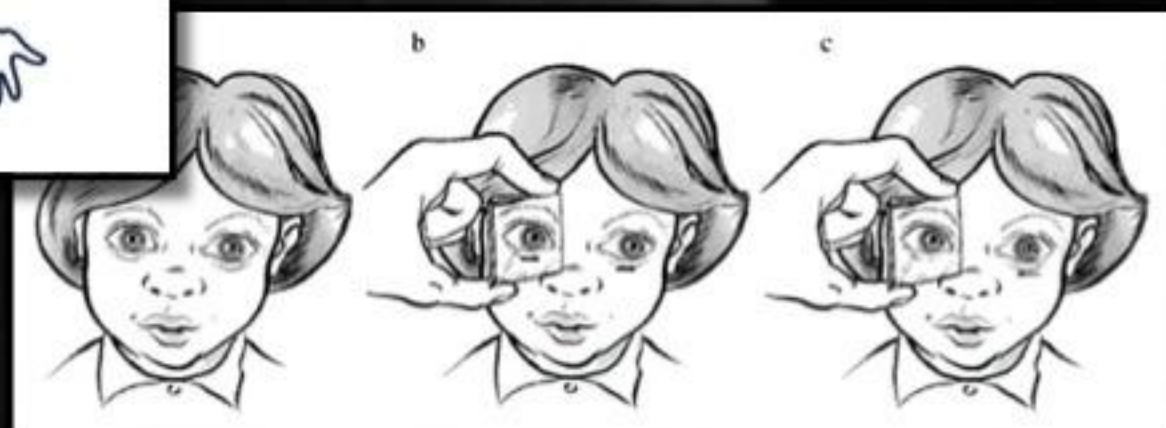
1. Visual acuity determination (determination of fixation preference < 3 years old)
2. Cycloplegic refraction
3. Orthoptic tests
4. Ophthalmological examination



Como preparare il bambino alla visita oculistica

Insegnare al bambino ad orientare la mano nelle quattro direzioni mostrate in figura.

The diagram illustrates four hand orientations: top-left (palm up), top-right (palm down), bottom-left (palm up), and bottom-right (palm down). Next to each is a corresponding letter: 'E' for top-left, 'W' for top-right, 'M' for bottom-left, and 'E' for bottom-right. Below the letters is a small chart with three rows: 'EW', 'MEW3', and 'EWMM'.



# CONSEQUENCES of not identifying amblyopia **EARLY**



**PERMANENT VISUAL IMPAIRMENT, ADVERSE EFFECTS ON SCHOOL PERFORMANCE, POOR FINE MOTOR SKILLS, SOCIAL INTERACTIONS, and SELF-IMAGE.** <sup>1</sup>

**Amblyopia is a RISK FACTOR FOR TOTAL BLINDNESS** if the better eye is injured or if the fellow eye is affected by disease later in life.<sup>2</sup>





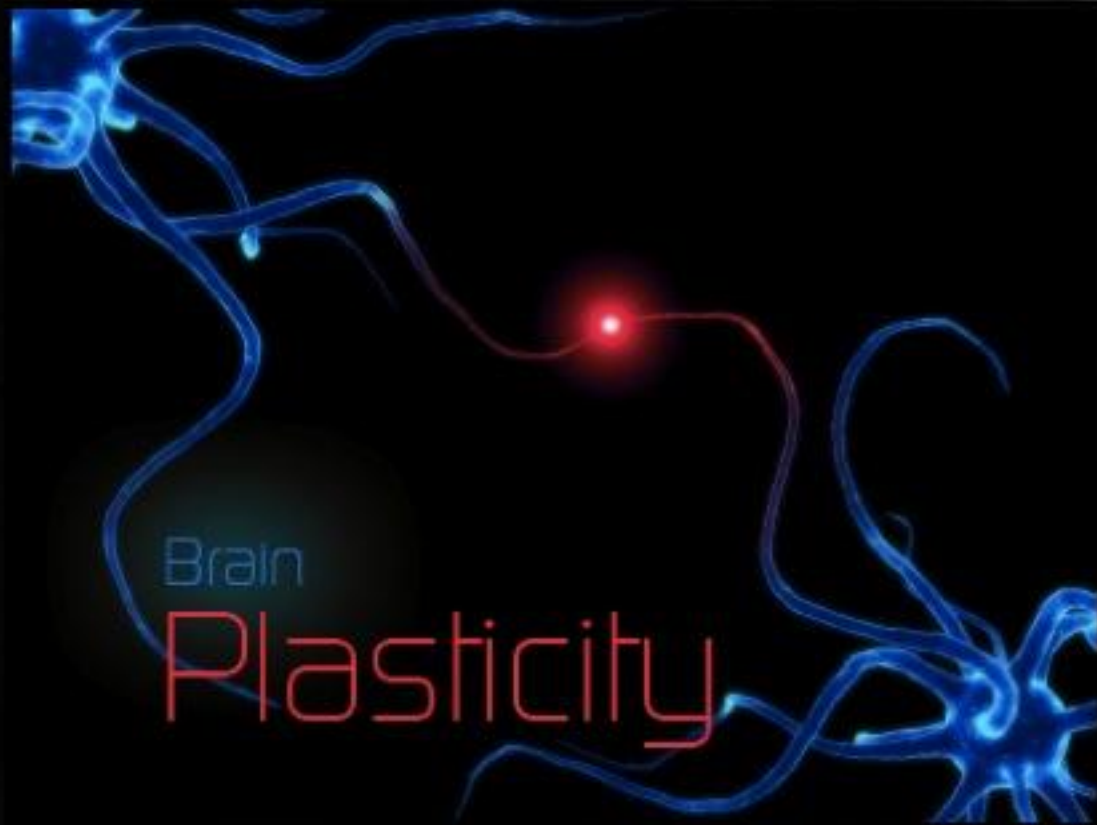
# BASIC TREATMENT of AMBLYOPIA

After optical correction, treatments for amblyopia rely on **DEPRIVING THE HEALTHY, FELLOW EYE OF VISION** to force use of the amblyopic eye.

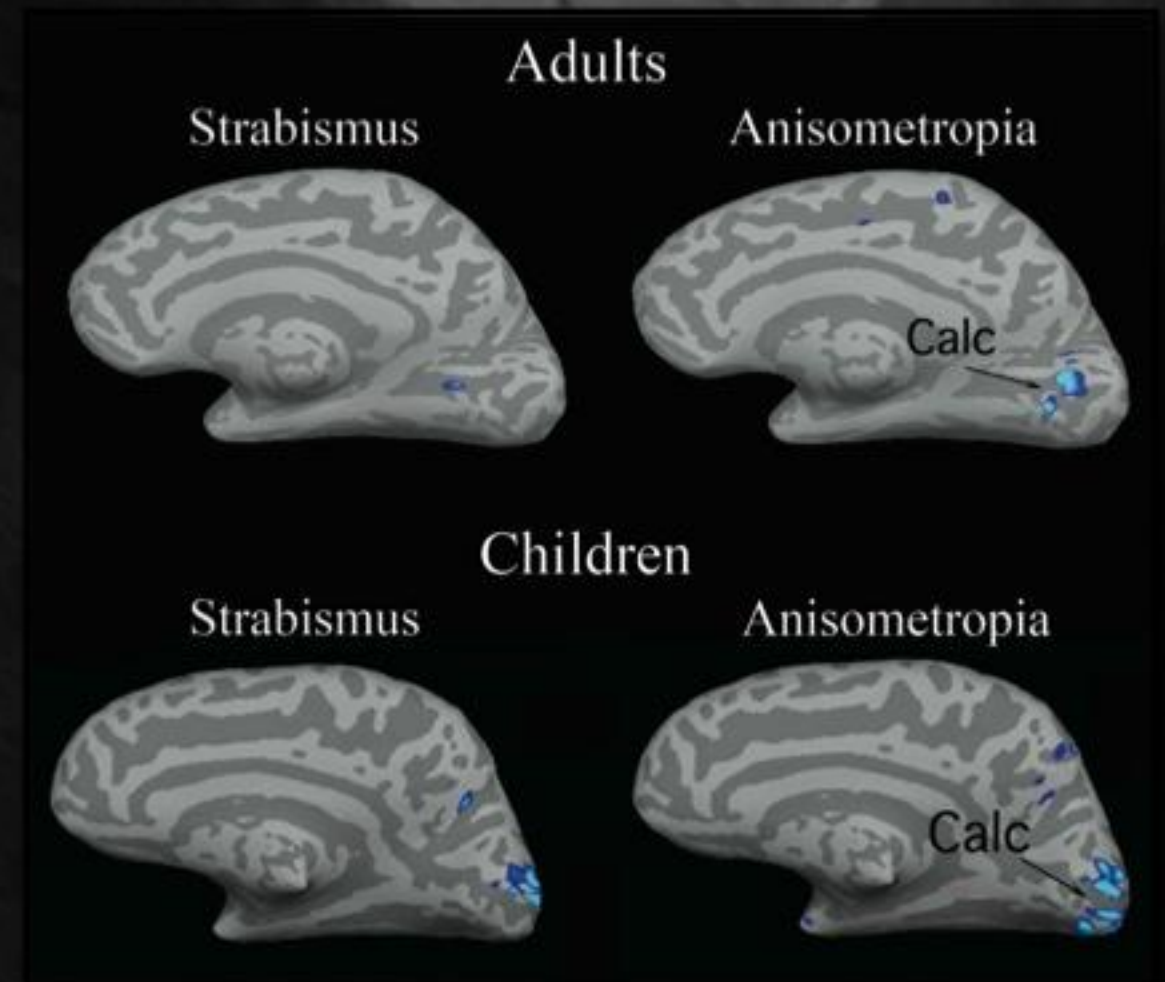


**Patching, atropine, and filters that penalize the fellow eye have been used to treat amblyopia.<sup>1</sup>**

# Why amblyopia treatment **MAY FAIL?**



**THE BRAIN PLASTICITY**  
(ability of the brain to change  
and adapt as a result of  
experience) **IS HIGHER IN THE  
FIRST YEARS OF LIFE**



# Why amblyopia treatment MAY FAIL?

## 1. THE TREATMENT WAS STARTED TOO LATE

- The first 7 years of life represent the critical period, since it coincides with the critical period for visual development.<sup>1</sup>
- Low prevalence of residual amblyopia after treatment **WHEN THERAPY WAS INITIATED BEFORE AGE 3 YEARS.**<sup>2</sup>



## 2. LACK OF COMPLIANCE WITH TREATMENT

Visual acuity outcome is related to compliance.<sup>3</sup>

- ## 3. Presence of **SUBTLE RETINAL, OPTIC NERVE, OR GAZE CONTROL ABNORMALITIES** that limit the potential for visual acuity recovery.<sup>4</sup>

1. Holmes et al. 2011

2. Williams et al. 2001, 2002, 2003

3. Loudon et al., 2002, 2003; Stewart et al., 2004; Stewart et al., 2007.

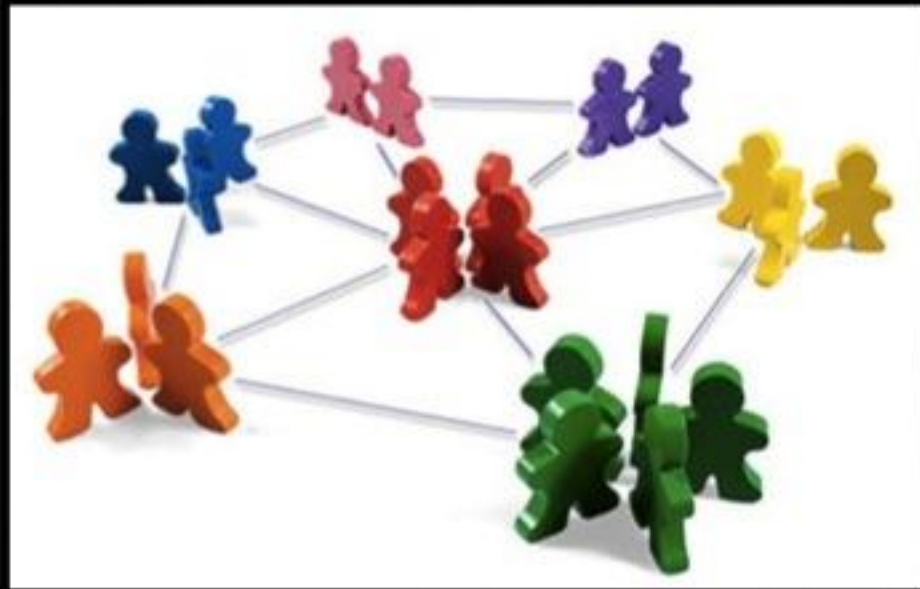
4. Giaschi et al., 1992; Lempert, 2000, 2003, 2004, 2008

# PREVENTION of amblyopia

## Network of **Early Detection** Strategy



**FAMILY**



**PEDIATRICIAN**

**SCHOOL**



**OPHTHALMOLOGYST**

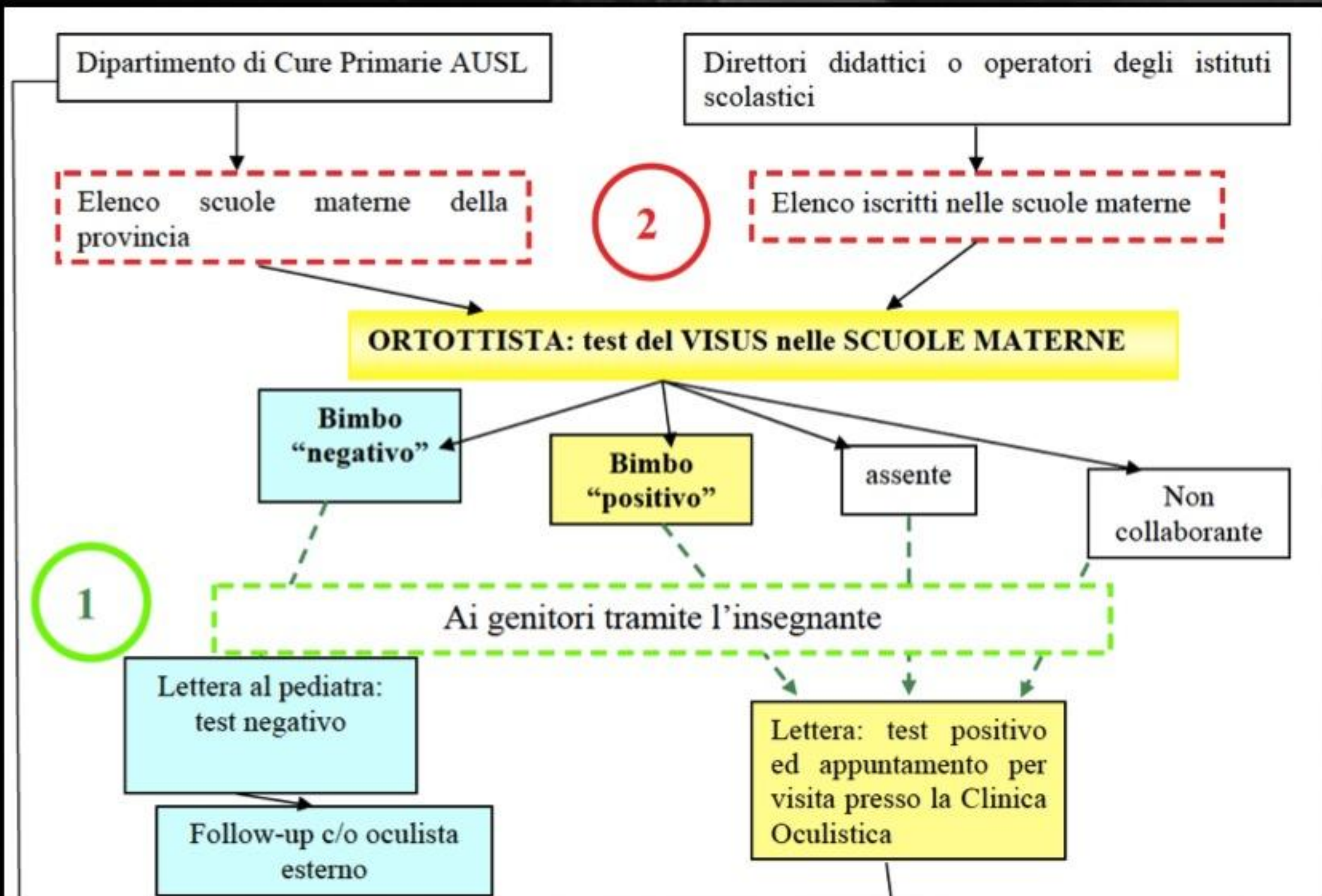


**ORTHOPTIST**



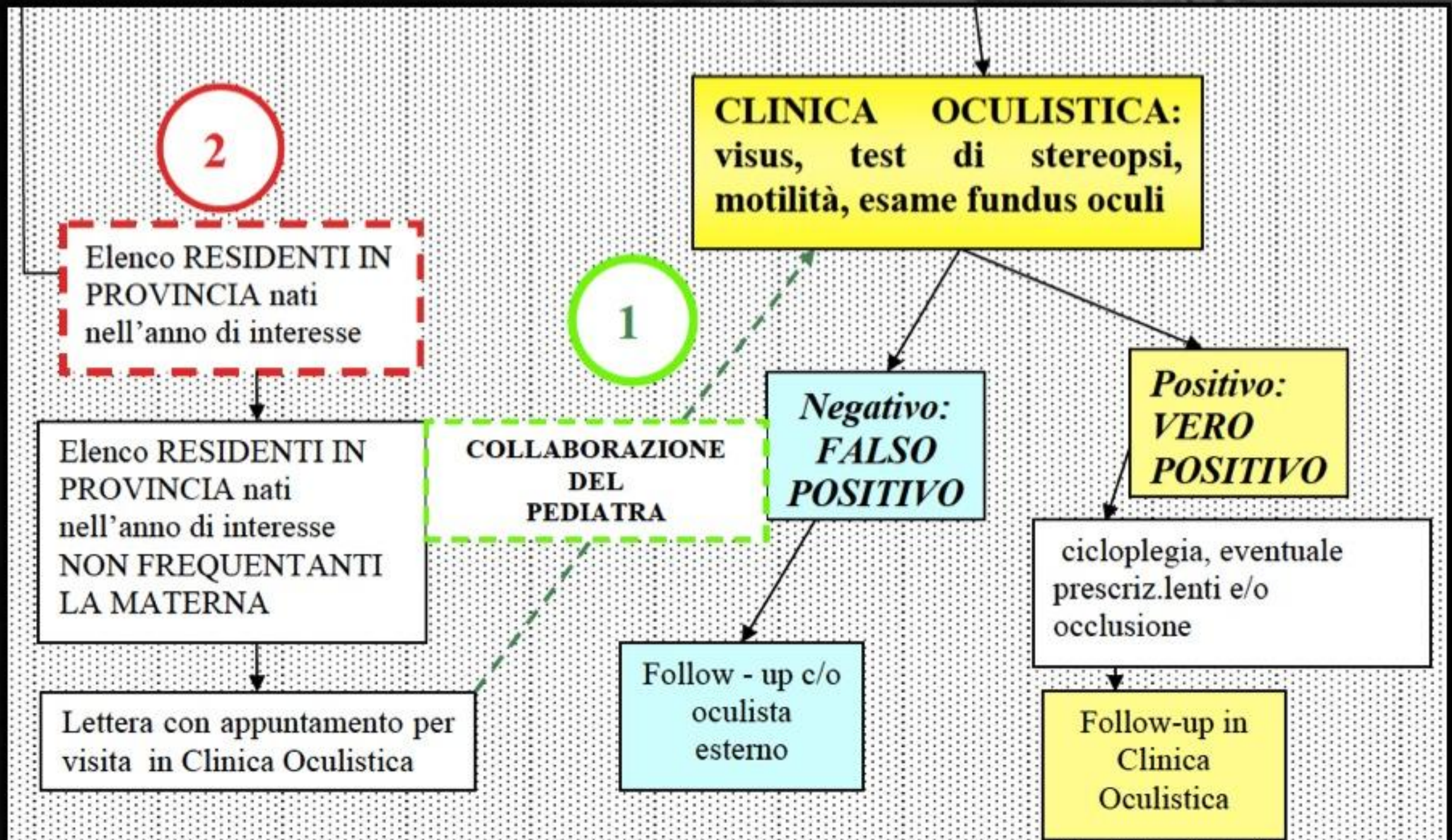
# WORK UP for amblyopia PREVENTION

## FIRST LEVEL



# WORK UP for amblyopia PREVENTION

## SECOND LEVEL





**HIGH TECHNOLOGY**  
in treatment of amblyopia and pediatric diseases

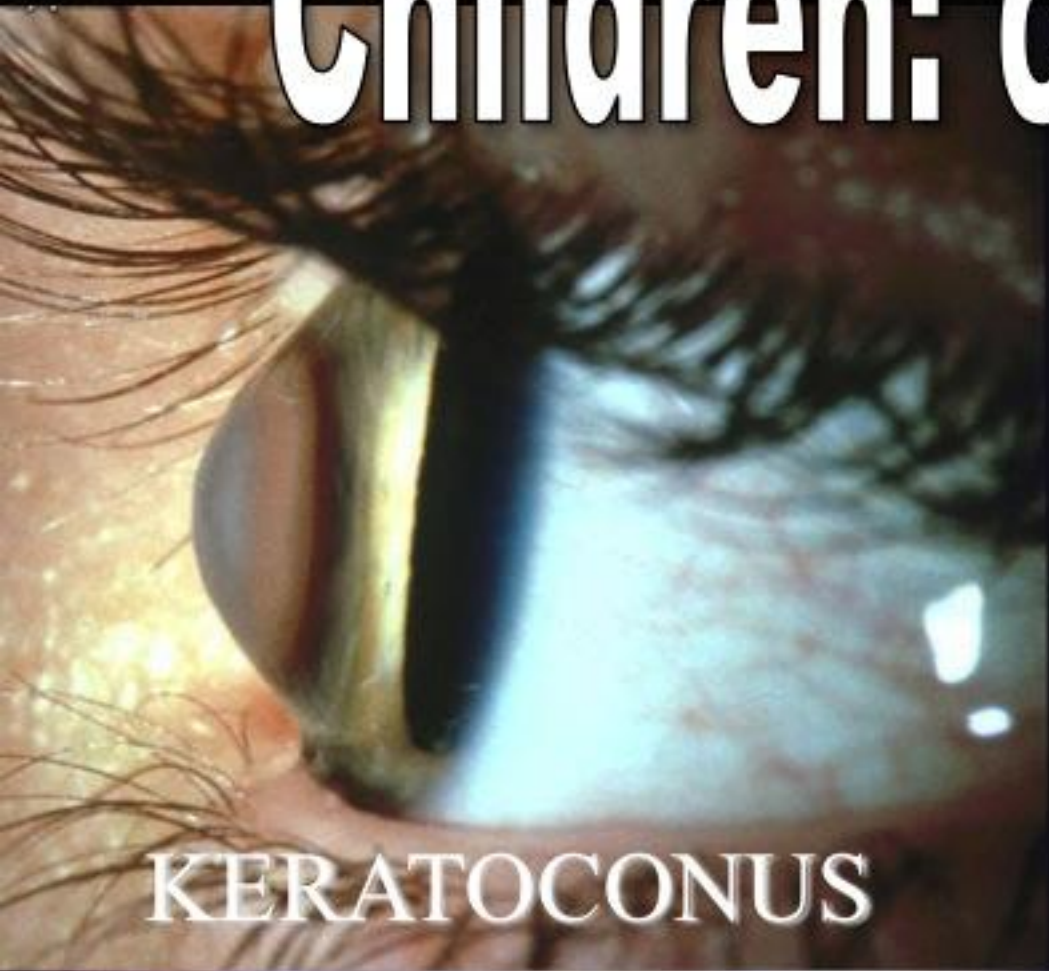
**Cornea**

**Cataract**

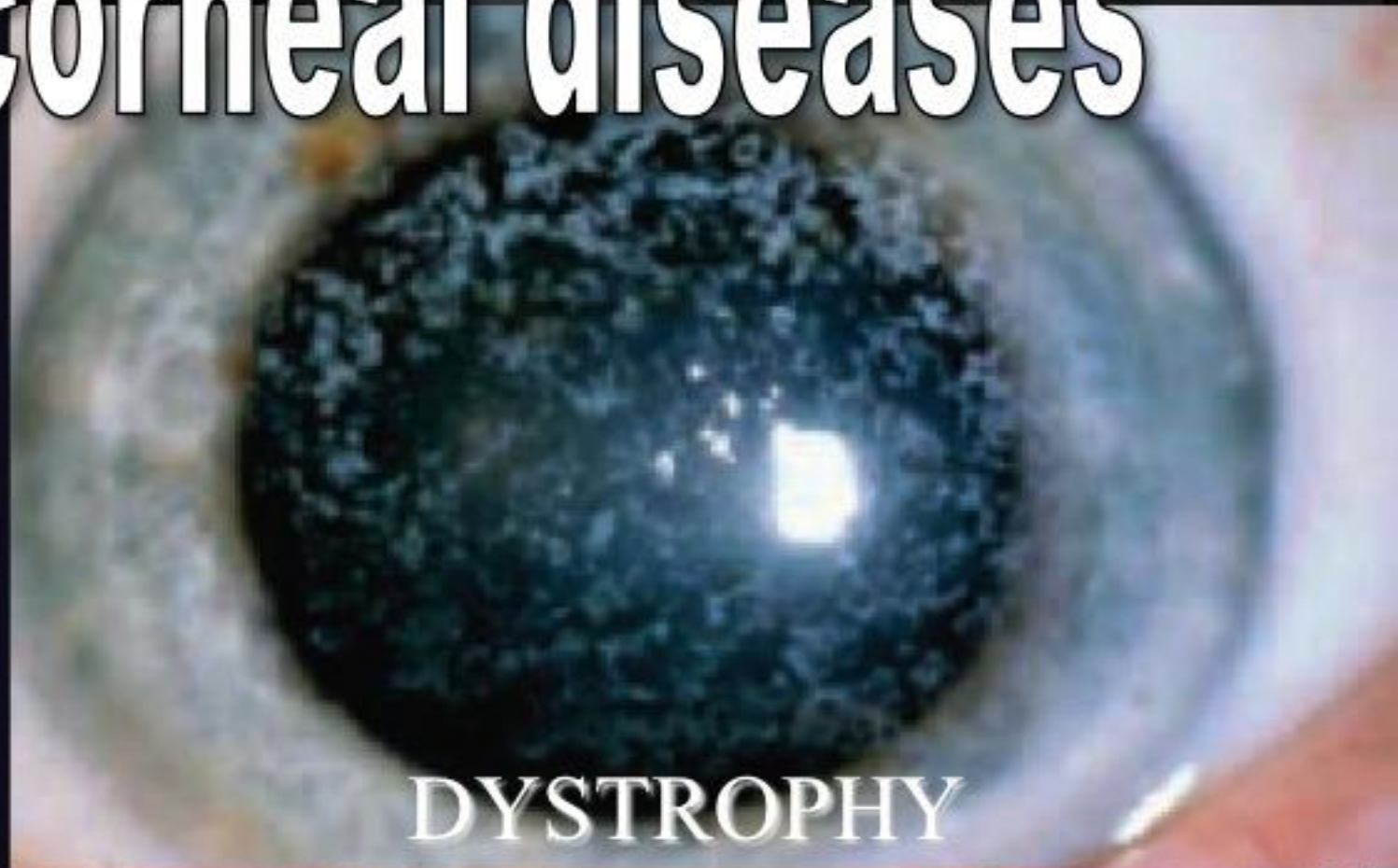
**Glaucoma**

**Retina**

# Children: corneal diseases



KERATOCONUS



DYSTROPHY



CONGENITAL LEUCOMA



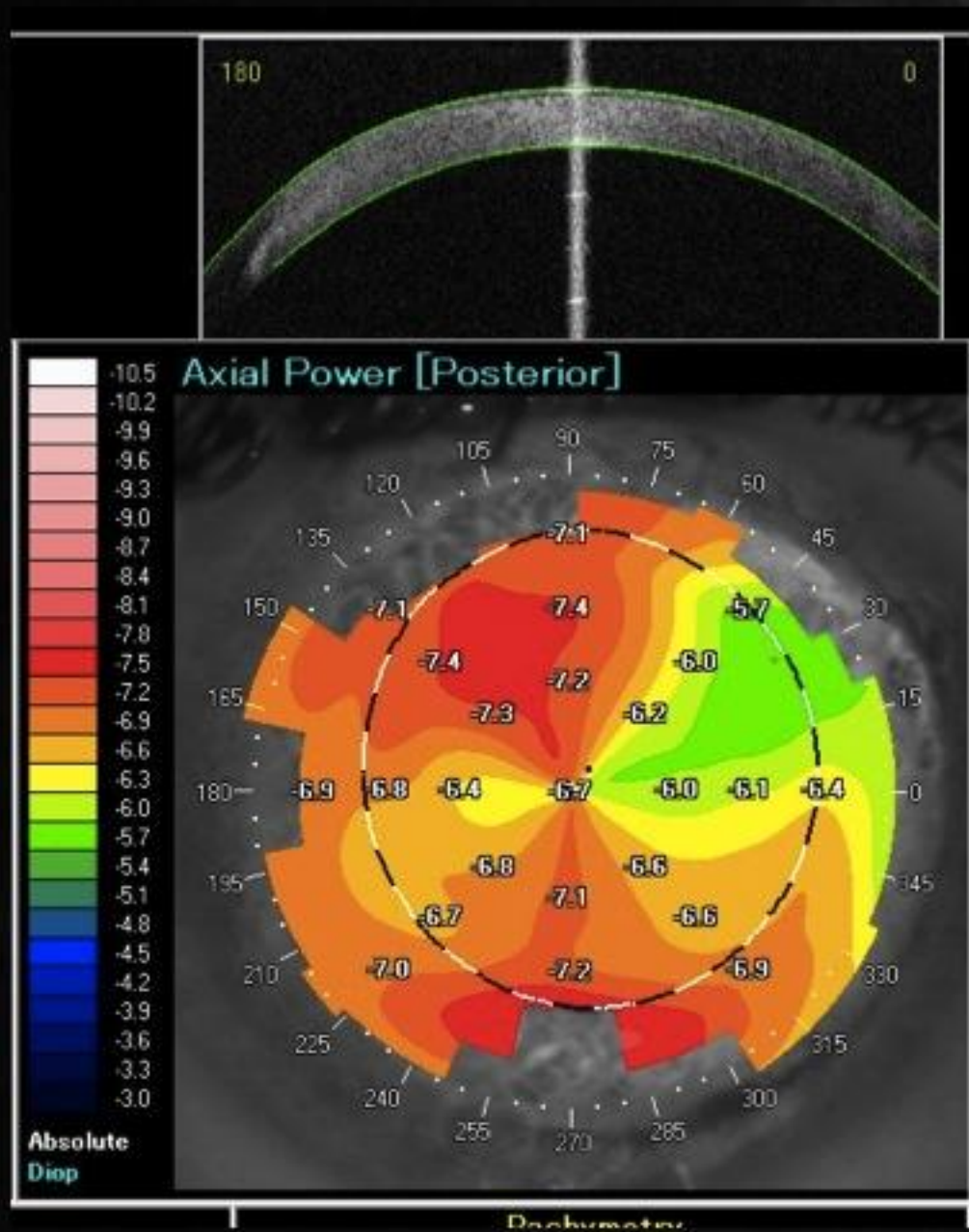
CONGENITAL LEUCOMA





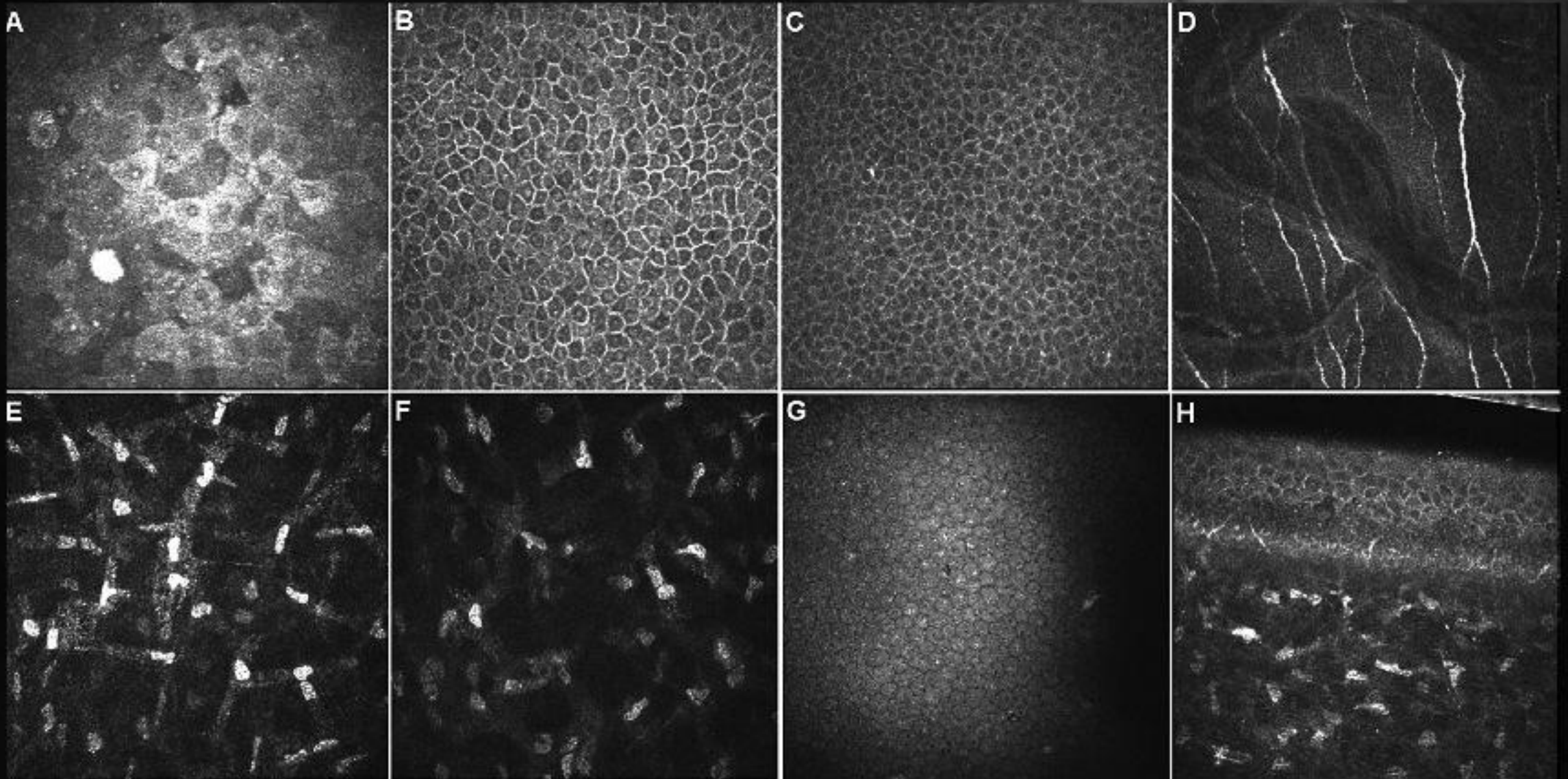
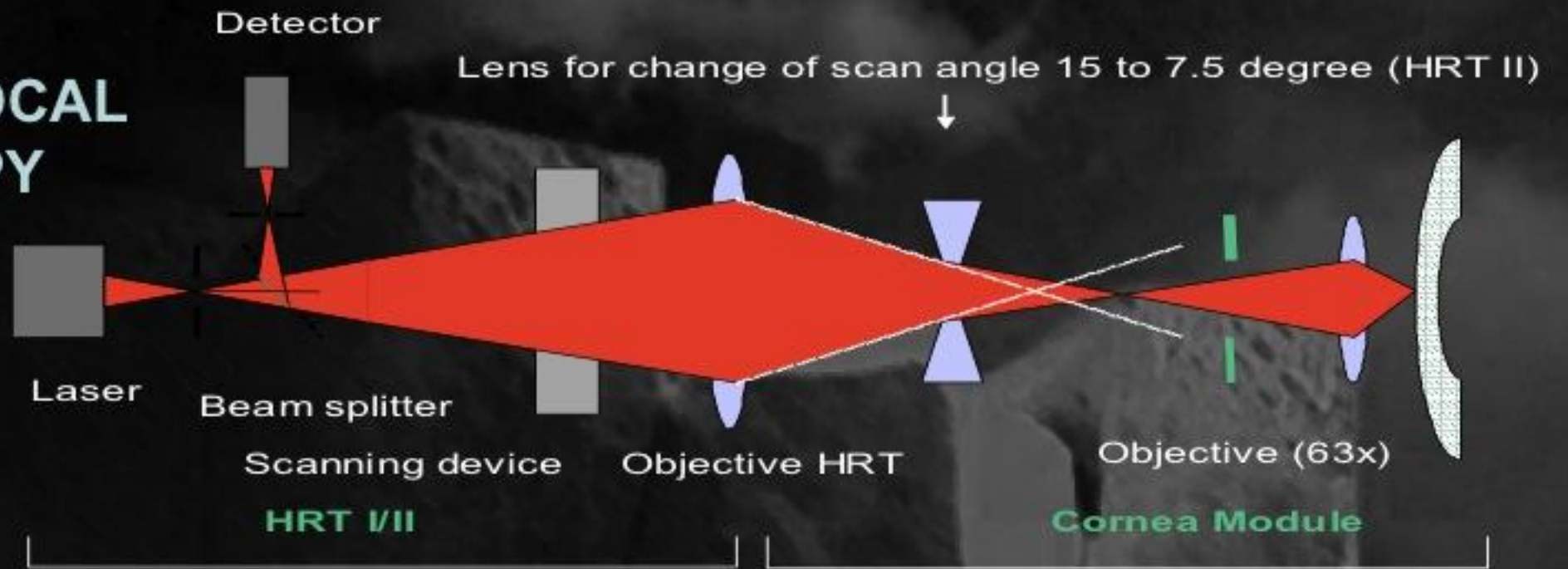
VISION IN  
KERATOCONUS

# HIGH TECHNOLOGY in CORNEAL IMAGING 3D



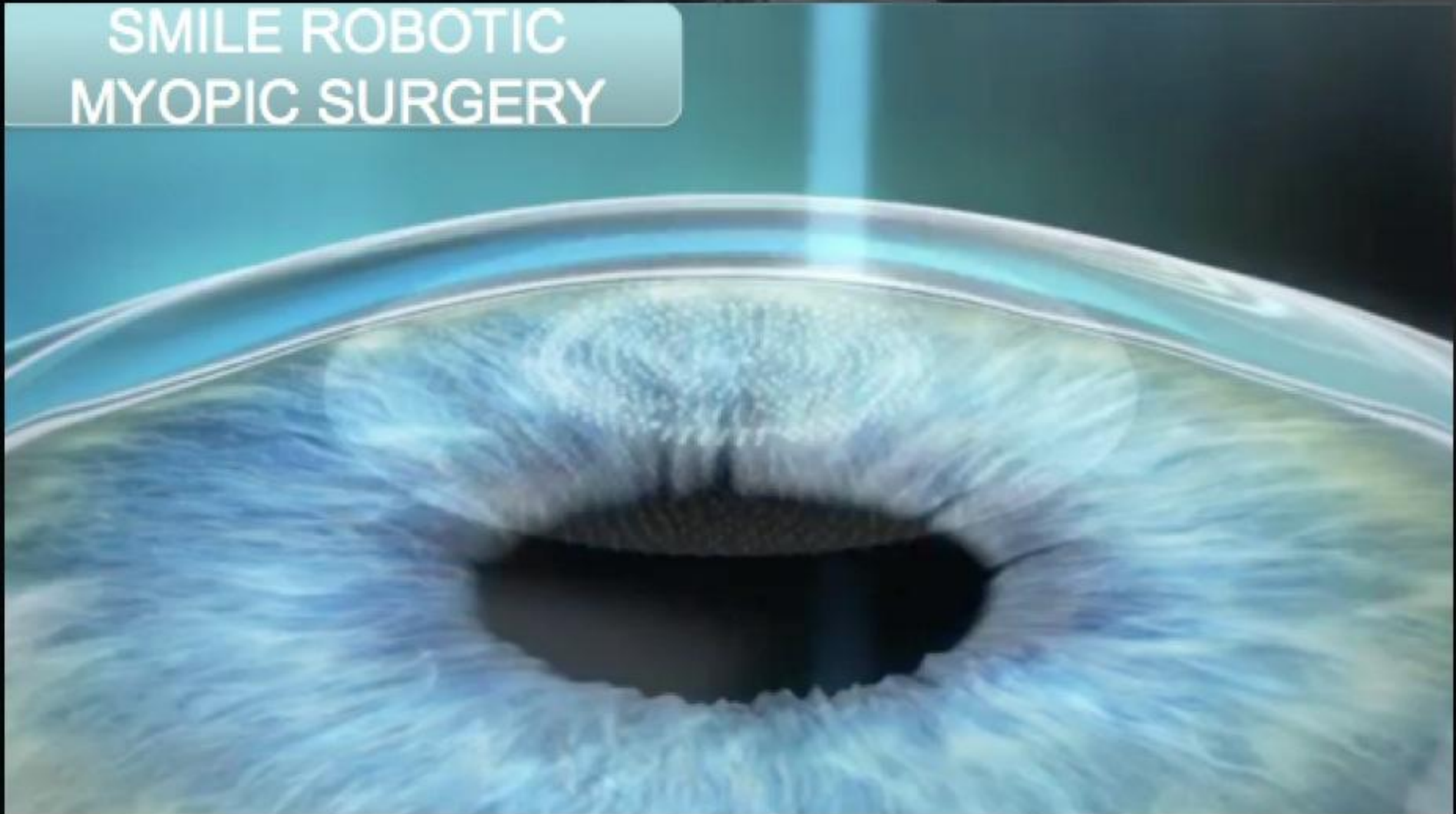
# Laser CONFOCAL MICROSCOPY

## CORNEAL CELL IMAGING

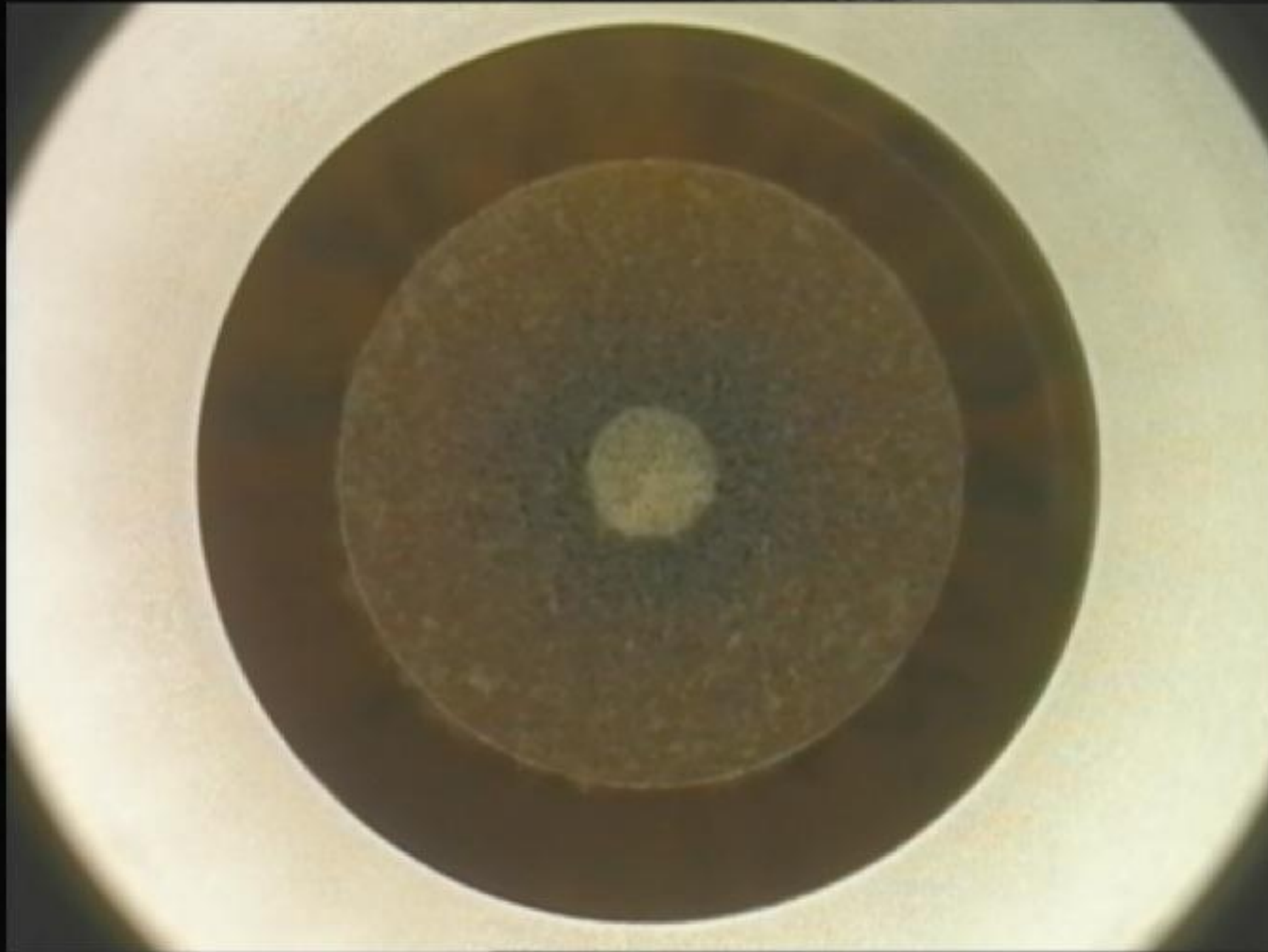


# SMALL INCISION LENTICULE EXTRACTION

SMILE ROBOTIC  
MYOPIC SURGERY

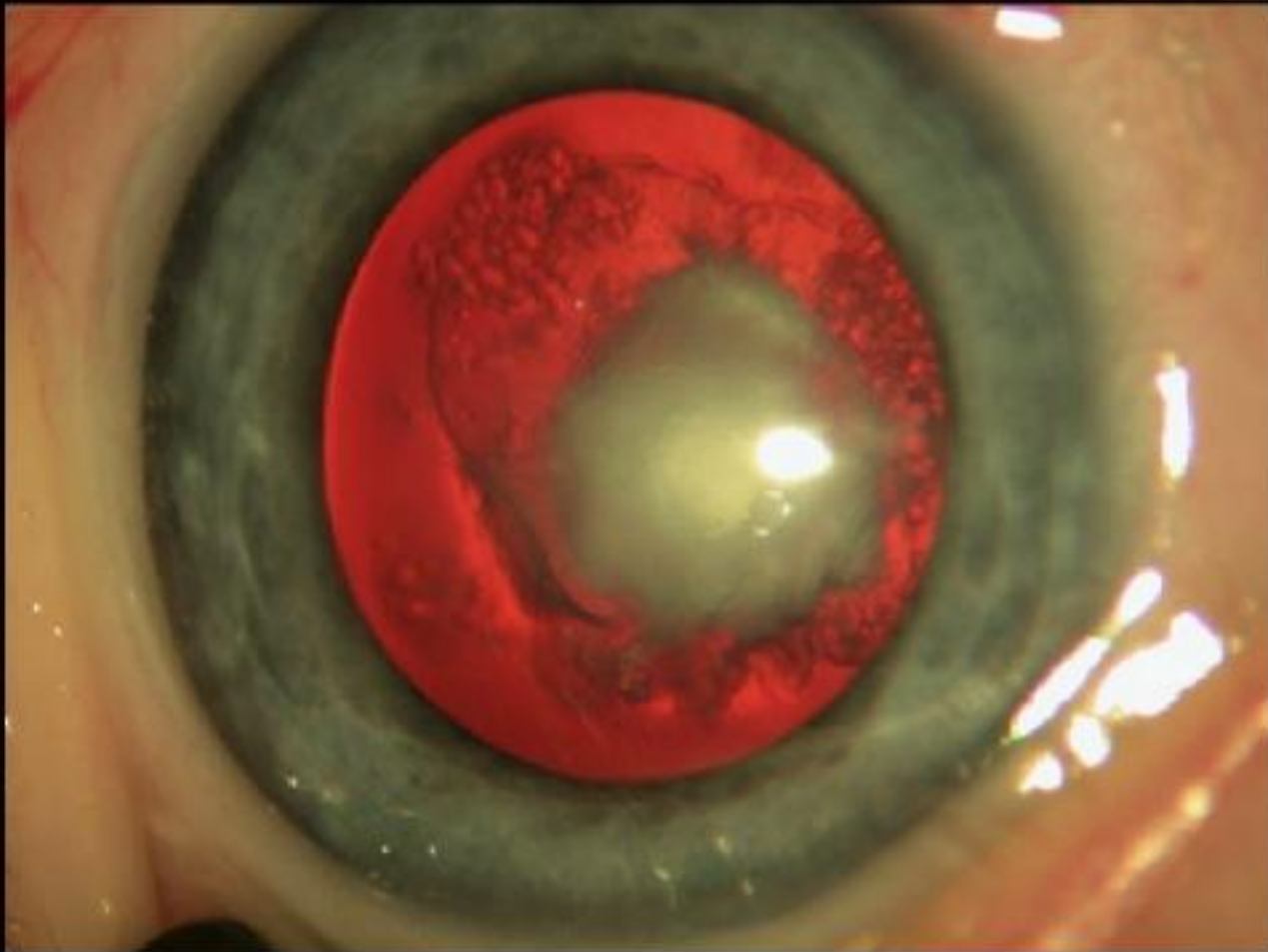


# ***SMILE Robotic laser Surgery to correct myopia and astigmatism***



***Mastropasqua's Small Incision  
Lenticule Extraction Kit***

# ***Congenital Cataract***



# ***Manual Cataract Surgery***



**Corneal incision**



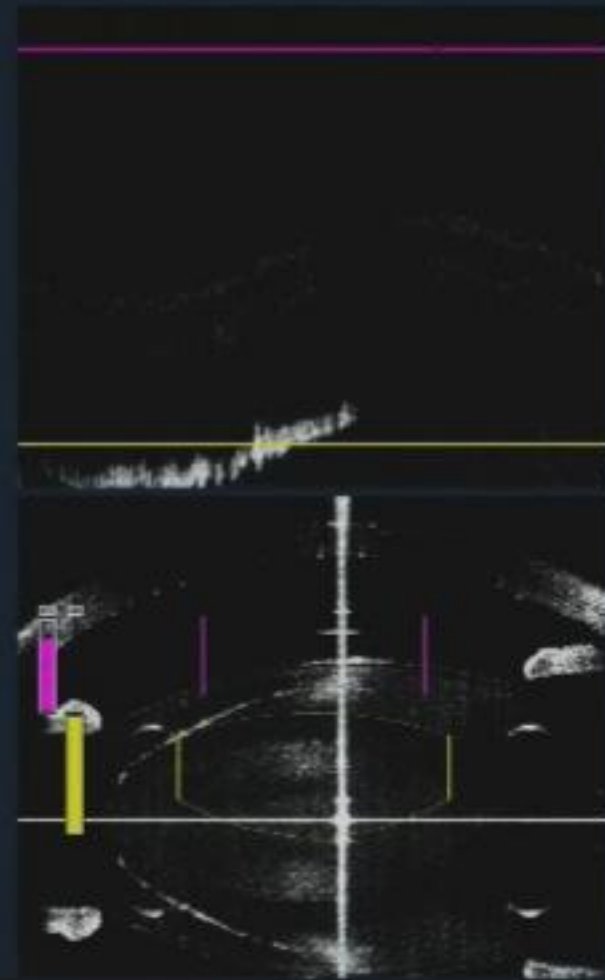
**Capsulorhexis**



**Lens  
Fragmentation**

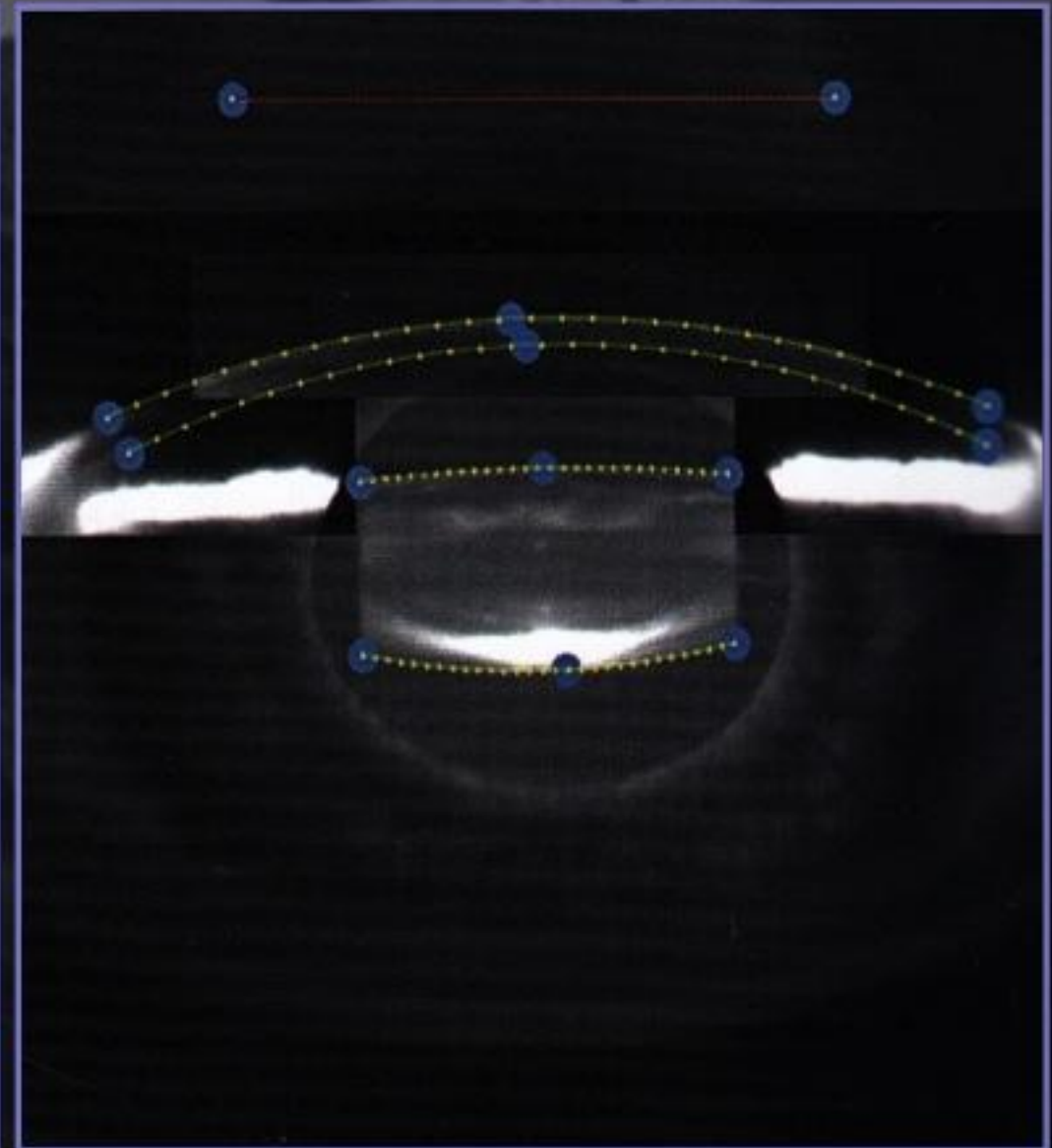
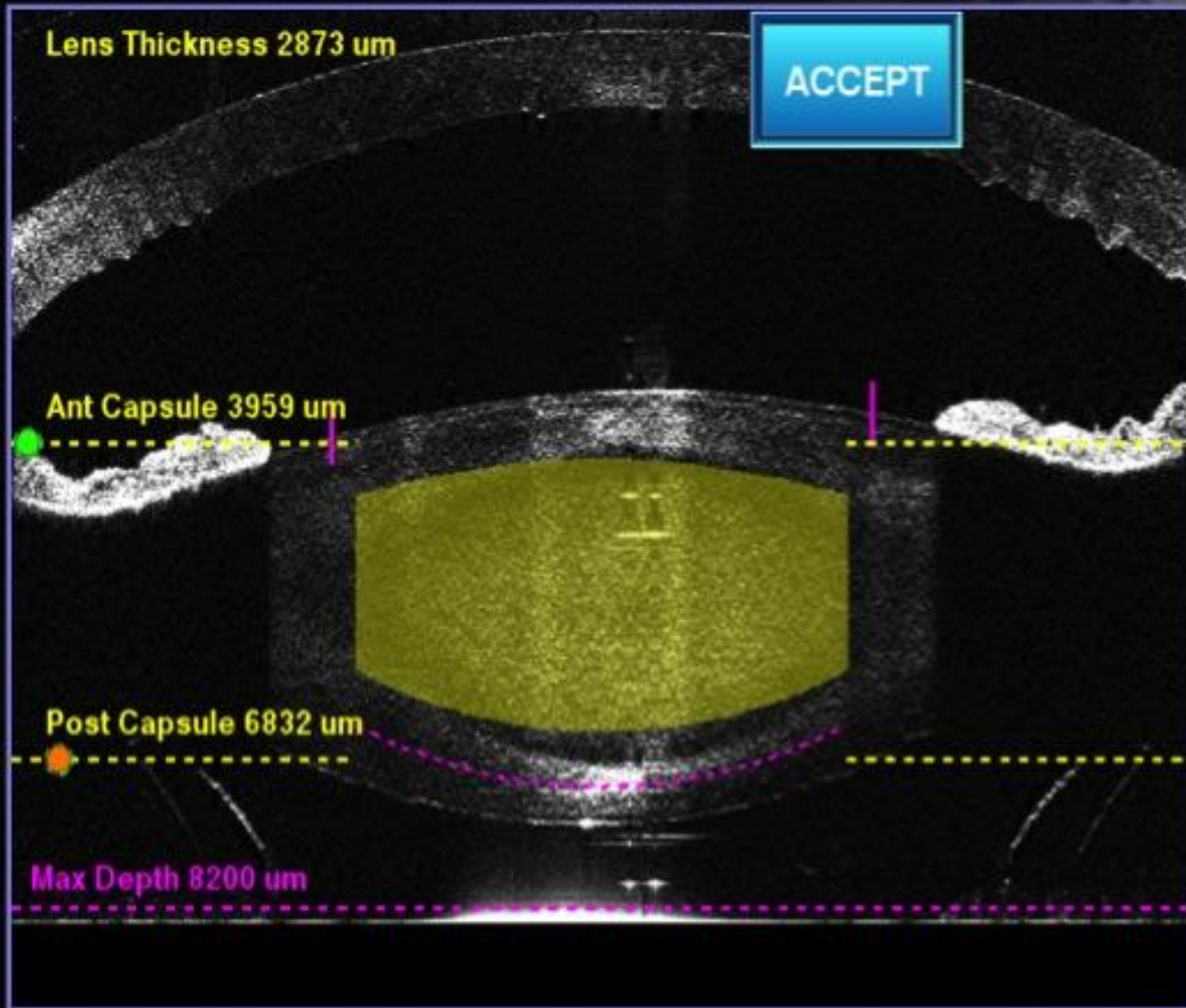
# ***Advanced cataract surgery***

## ***Femtosecond laser***





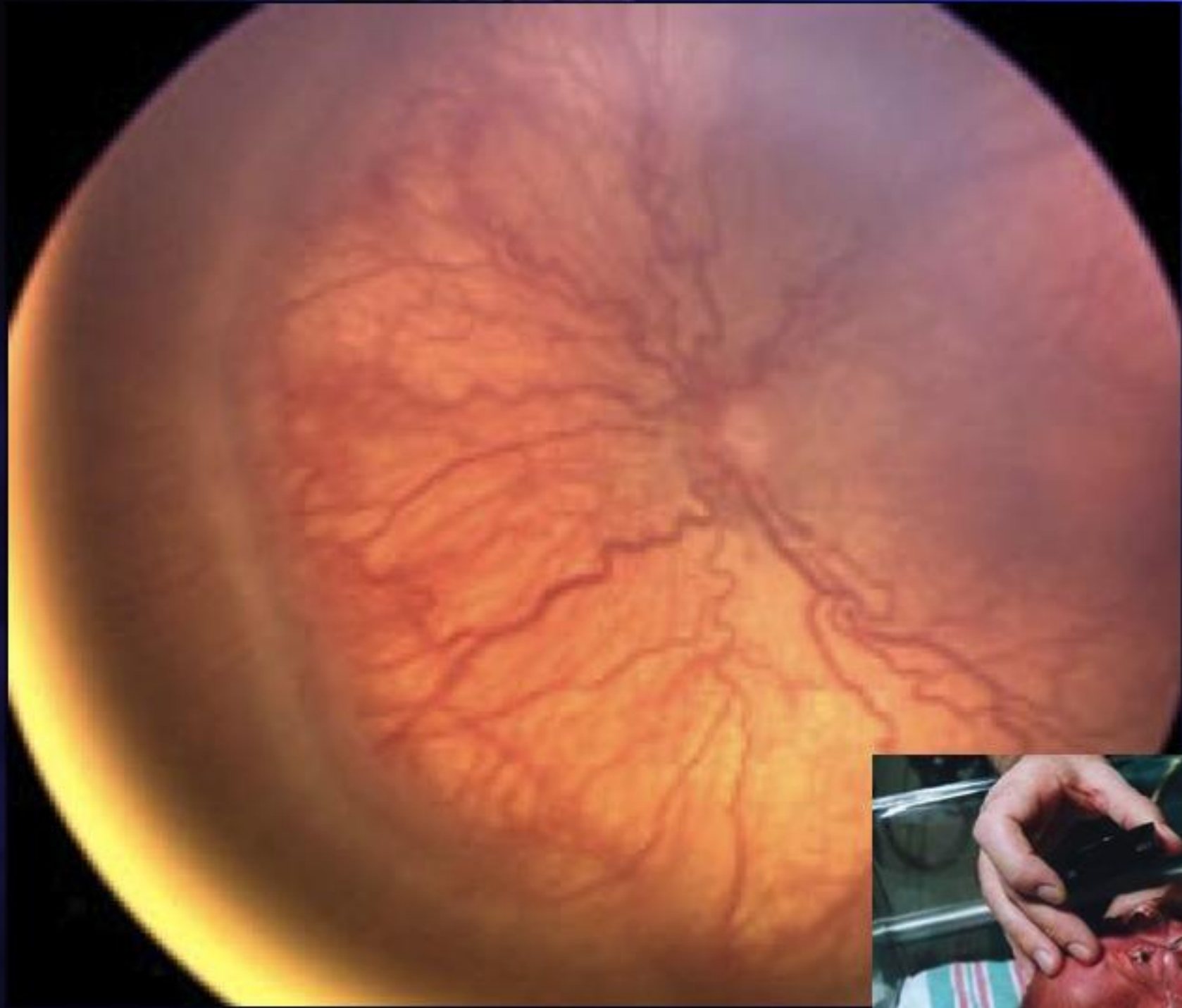
# OCT or Scheimpflug visualization system



# ***Femtolaser cataract surgery***



# *Retina*



# Navigated laser

The screenshot displays the NAVILAS laser control interface. At the top, the NAVILAS logo is on the left, and navigation tabs for Patient, Imaging, Annotate, Planning, Treatment (highlighted), and Reporting are in the center. On the right, it shows 'Physician' and the time '10:51:25' with a home icon.

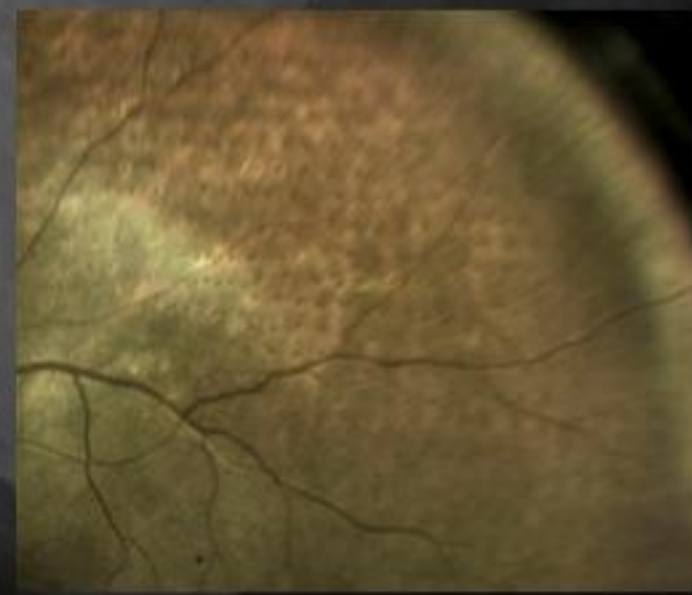
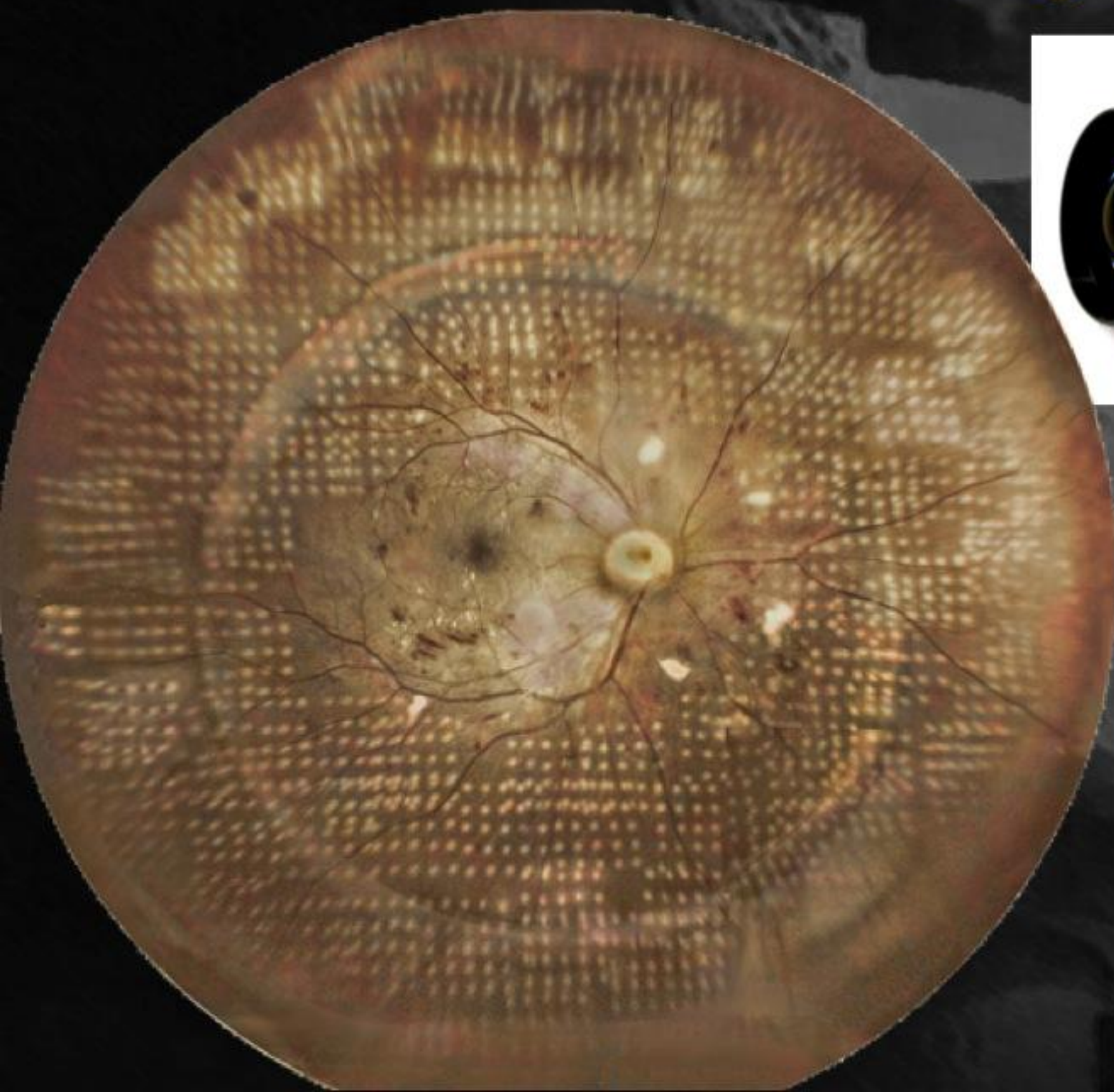
The main display area shows a fundus image of the right eye (OD) with a treatment plan overlay. The plan consists of a grid of 203 spots and two circular targets. The left target is a solid yellow circle, and the right target is a yellow circle with diagonal hatching. Two yellow lines connect the two targets.

On the left side, there are control panels for Intensity (set to 5), Illumination Mode (Color and IR), Start Treatment, and Laser Standby. Below these are Navigation controls for Target Assistance and Overlay. A Selected Treatment Plan window shows a smaller view of the treatment area with the text '0 of 203 spots applied'.

At the bottom, there are controls for Laser Power (50 mW), Pulse Duration (100 ms), and Spot Size (100 μm). The bottom right corner shows the patient information '4/4/1942 Male' and a copy icon.

Spots: 0, Confirmed: 0

# Panretinal Photocoagulation



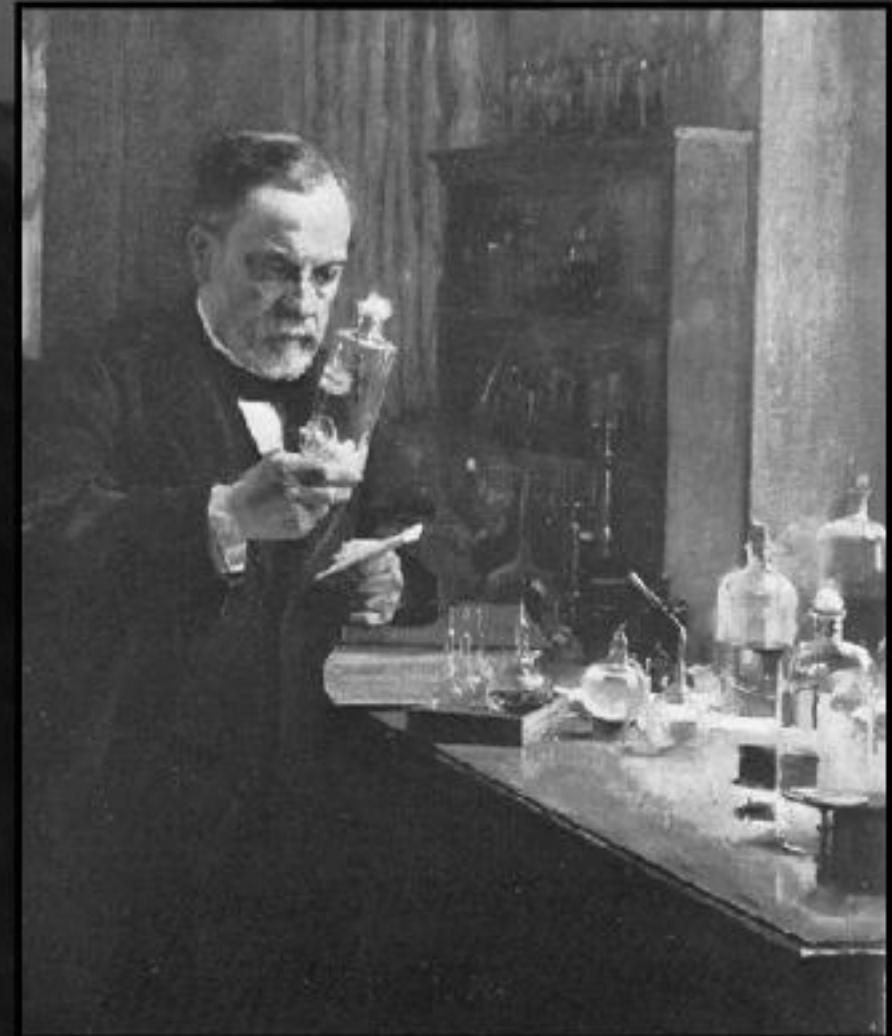
# ***Conclusions***

**Prevention**

**Early diagnosis**

**Early treatment**

**High technology**



*“In the fields of observation,  
chance only favors prepared minds”*

*Louis Pasteur, 1854*