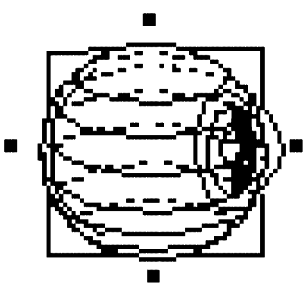
# Implantable Miniaturized Telescope (IMT) for Low-Vision

Eli Peli[1, 2], Gideon Dotan[2], Eli Aharoni[2], Alon Sadeh[2] and Isaac Lipshitz[2]

**1-The Schepens Eye Research Institute, Harvard Medical School, Boston MA, USA**

**2-VisionCare, Inc., Yehud, Israel**



VisionCare
OPHTHALMIC TECHNOLOGIES LTD


VisionCare
OPHTHALMIC TECHNOLOGIES LTD

# Age-Related Macular Degeneration

- About 5% of western world population is >75y/o.
- The western population is “getting older”.
- About 30% of  people >75y suffer AMD.

**No effective treatment for a large population**.

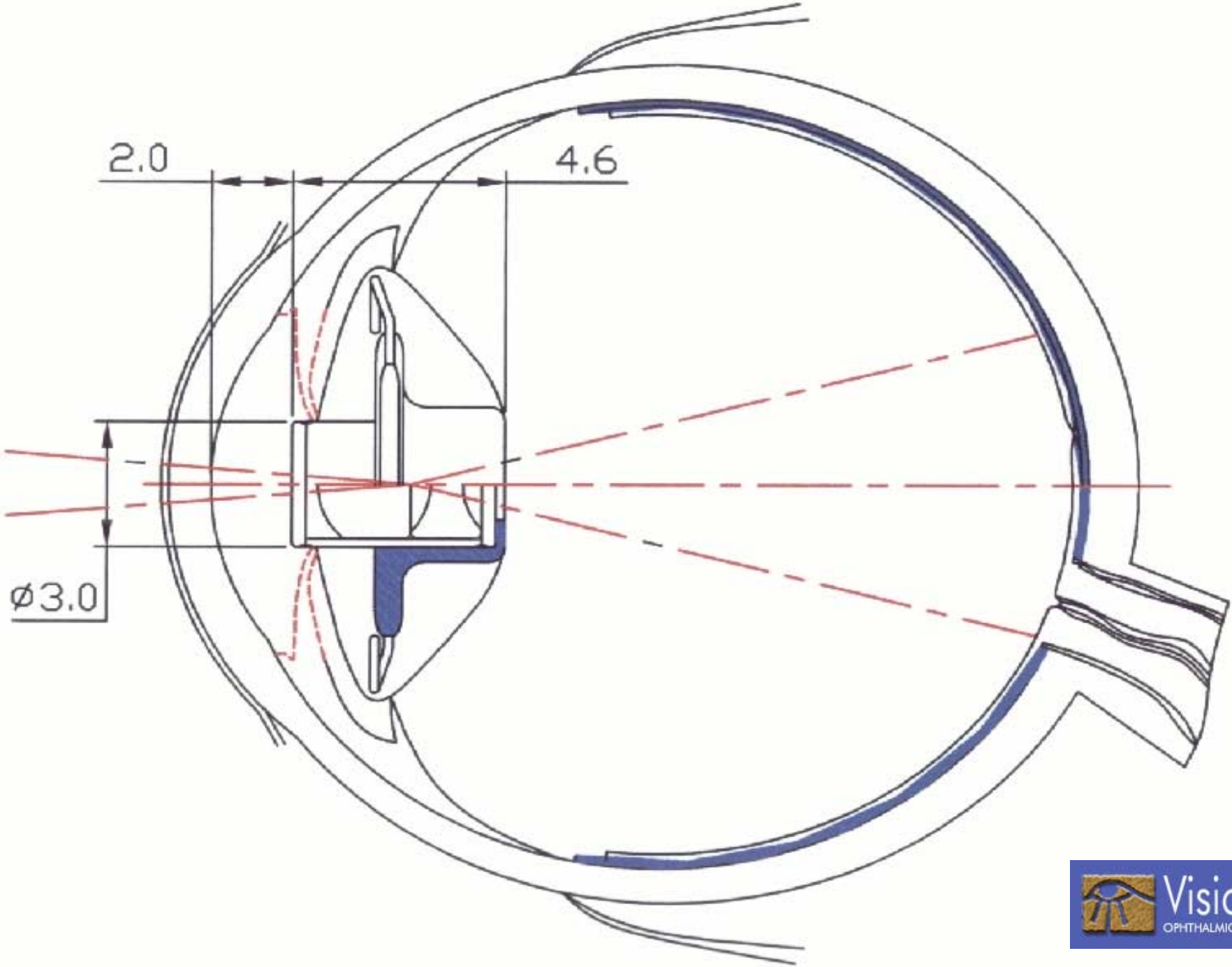
# Concept of IMT™

- Miniature telescope fully implanted in the eye.
- Implanted only in one eye (monocular).
- Enables distance & near vision (with spectacles).

# IMT™ Visual Functions Principle:
## Bi-Ocular Multiplexing

- **Central vision** using the ***operated eye*** (through the **IMT™** ).

- **Peripheral vision** using the ***fellow eye***.




VisionCare
OPHTHALMIC TECHNOLOGIES LTD

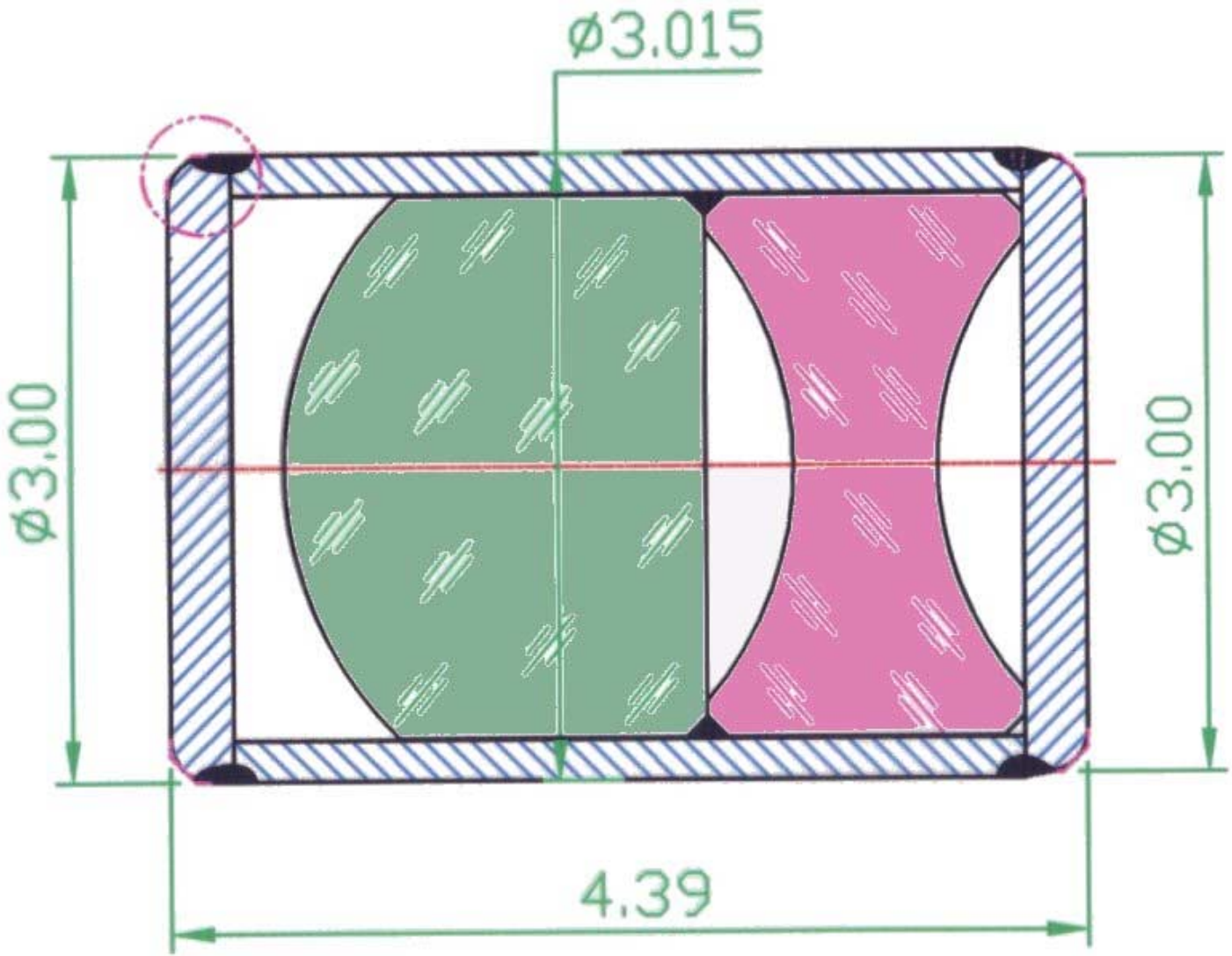
# IMT™ Dimensions

## *Size*

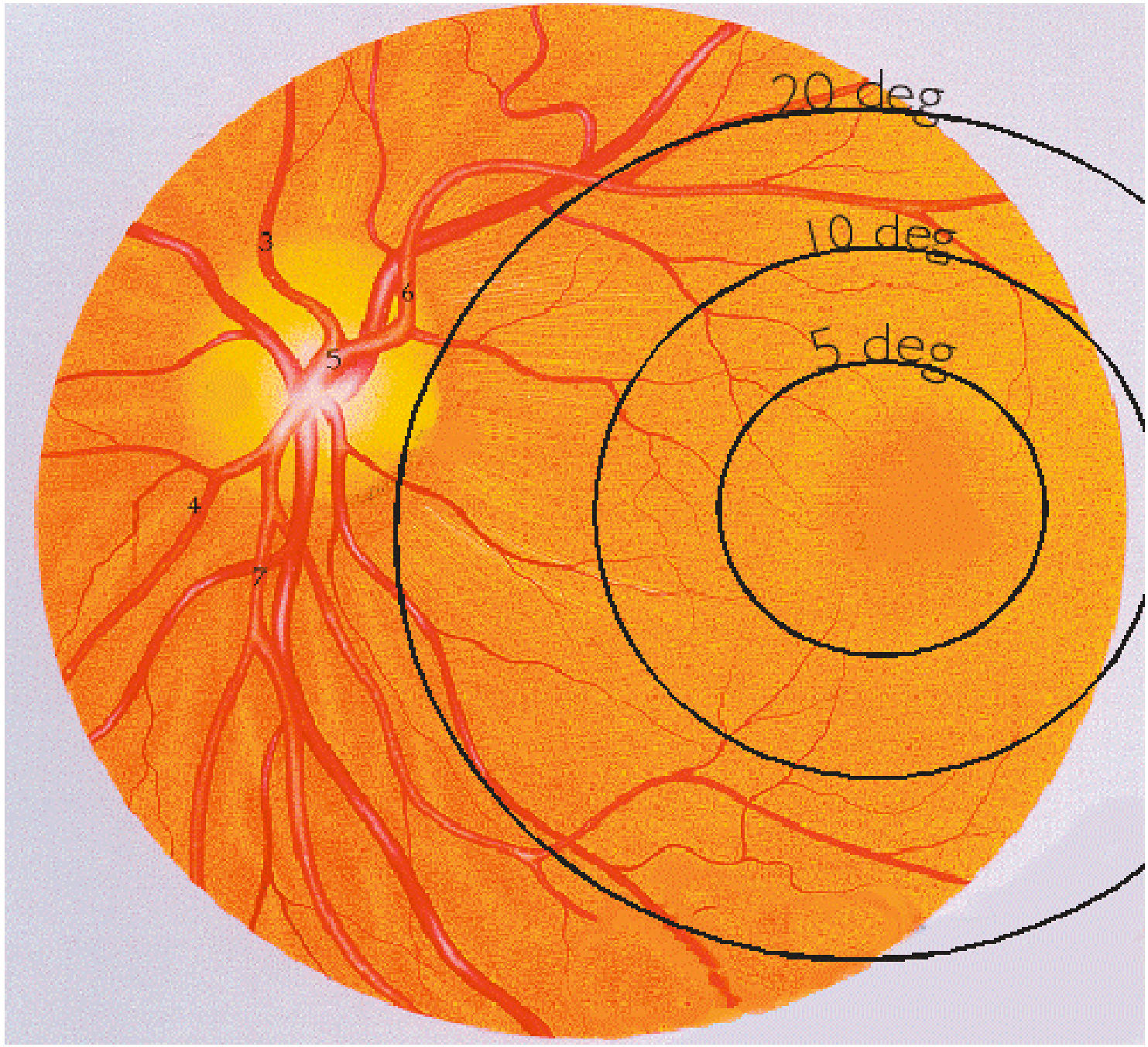
- Fits the lenticular capsule (“bag”).
- Optical cylinder Size:
  - Length (ant.-post.): 4.6mm.
  - Diameter: 3.0mm.
- Corneal endothelium - Safety distance - 2mm.

## *Weight*

- **IMT™** weight in aqueous - 45mg (equal to 4 IOL’s).
- Supportable by the “bag” and the iris.




VisionCare
OPHTHALMIC TECHNOLOGIES LTD


20 deg
10 deg
5 deg
3
6
5
4
7

# IMT™ -Variable Magnifications

## One Size Fits All

| Object Distance | Eyeglasses lens | Mag. |
|---|---|---|
| 50cm | Dist. Rx | 3X |
| 30cm | Rx +1.5 D | 5X |
| 25cm | Rx +2.2 D | 6X |
| 20cm | Rx +3.2 D | 7.5X |

# Patient Selection Criteria

- Bilateral stable “dry” type AMD

  OR

  Disciform AMD in the eye planned for operation.
- No other eye disease (except for cataract).
- Visual acuity not better than **20/80** (6/24), and not worse than **20/400** (6/120) in either eye.

# Patient Selection Criteria (cont.)

- Visual acuity as similar as possible in both eyes.
- **Improved** V.A. with external telescope in planned eye, **better** than fellow eye B.C.V.A.
- The patient shows interest and understands the need for visual rehabilitation.

# Surgical Techniques

## ■Limbal Approach

- ■ Limbal incision -10mm (140°-160 °).

## ■Scleral Tunnel

- ■ Tunnel location: 3-4mm posterior to limbus.
- ■ 10mm incision - wide and long “tunnel”.
- ■ Short healing period, no astigmatism.

# Pre-and Post-Op Care

## *Teamwork of Ophthalmologists & Low-Vision Experts*

- Patient selection and evaluation
- Medical / Surgical treatment.
- Refraction, astigmatism correction and suture removal.
- Low-Vision Rehabilitation.


0000
VisionCare
OPHTHALMIC TECHNOLOGIES LTD

# European Clinical Trial

- Total 46 patients (9 blind eyes, safety only)
- Follow-up
  - 2 months - 31 patients
  - 3 months - 21 patients
  - 6 months - 20 patients
  - 12 months - 11 patients
- Distance VA, Near VA, ADL (Activities of Daily Living)

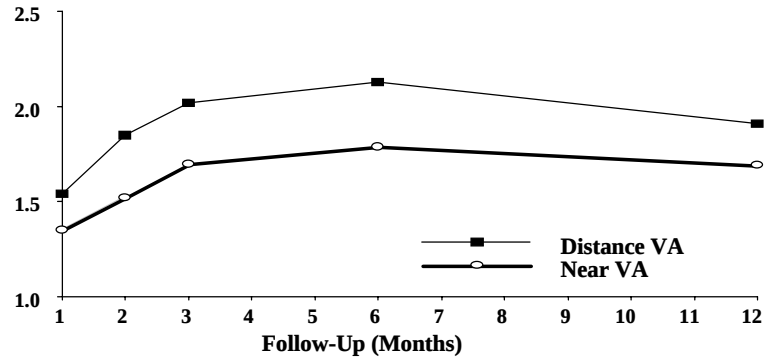
# Clinical Trial Results

## Visual Acuity

■ **Distance Visual Acuity:**

At 6 months improved in 86% of patients.

mean improvement 2.1×




■ **Near Visual Acuity:**

At 6 months improved in 95% of patients.

mean improvement 1.8×

Improvements are statistically significant by Wilcoxon Signed Test ($p<0.0005$)

# Activities of Daily Living

- Actual environment for tasks set up locally
- Subjective reporting of difficulty with task
- Rank as:
  - Impossible to do 0
  - Possible with great difficulty 1
  - Possible with some difficulty 2
  - Easily done 3

# Clinical Trial Results

## Subjective Reports
## improved performance at 6 months

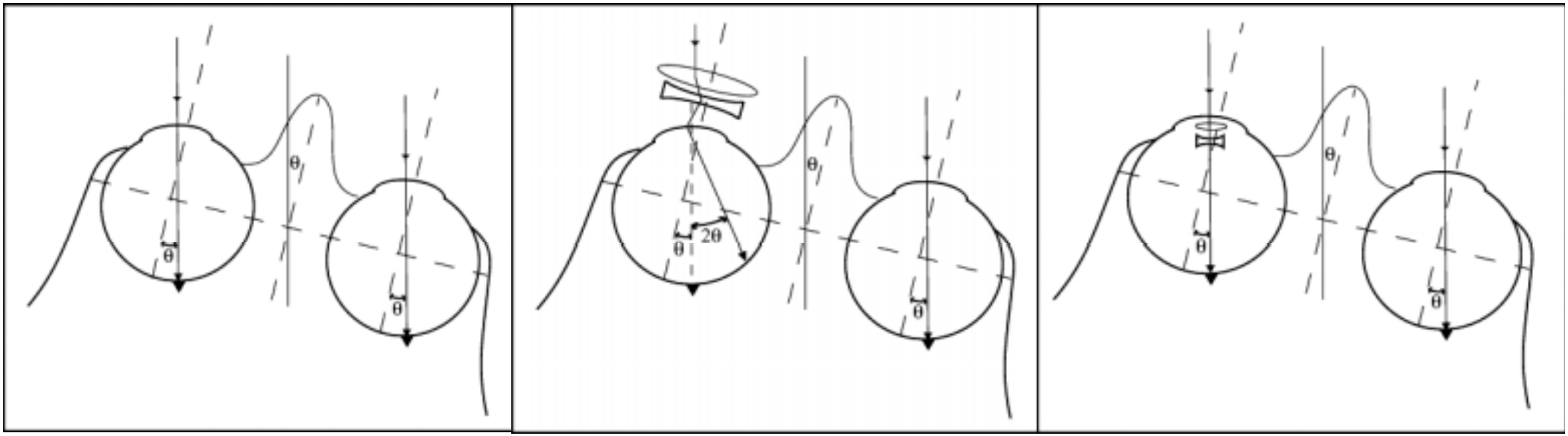
- Reading newspaper 90%
- Face recognition 80%
- Table orientation 70%
- Watching TV 90%

Improvements are statistically significant by Wilcoxon Signed Test ($p<0.006$)

# Advantages of IMT™

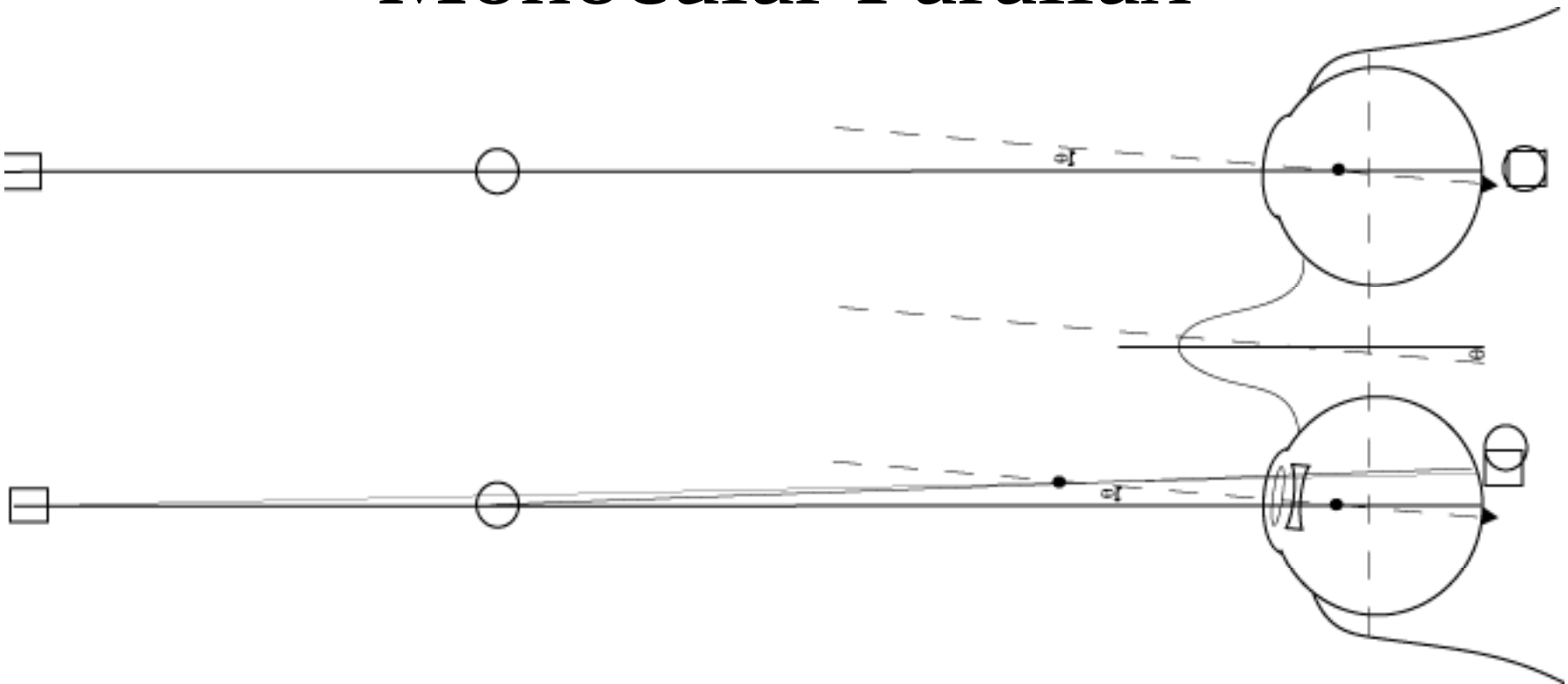
- Enhanced central while maintaining peripheral vision
- No relative movements between eye / telescope.
- Natural scanning of visual field.
- No “escape” from adaptation.
- Patient comfort and cosmetic advantages.

# Improved Image Stability and Orientation




- (**a**) A head rotation without optical device, VOR useful
- (**b**) With a head-mounted telescope (3.0X) the VOR generated eye rotation will not suffice ⇒ image motion, reduced visibility, and possibly motion sickness.
- (**c**) Telescope inside the eye restores natural  VOR function.

# Restoring Depth Perception Through Monocular Parallax



- Monocular nature of the device eliminates stereo vision.
- Monocular depth perception is significantly improved due to anterior position of the nodal point in front of the eye (similar to the eye of the Chameleon).

# Problem

- AMD - leading cause of blindness.
- Numbers of AMD patients growing.
- No treatment for most patients.

# Solution

- **IMT™ - Implantable Miniaturized Telescope**.
- Optical solution for AMD patients.
- Unique functional advantages.
- Cosmetically acceptable (invisible)