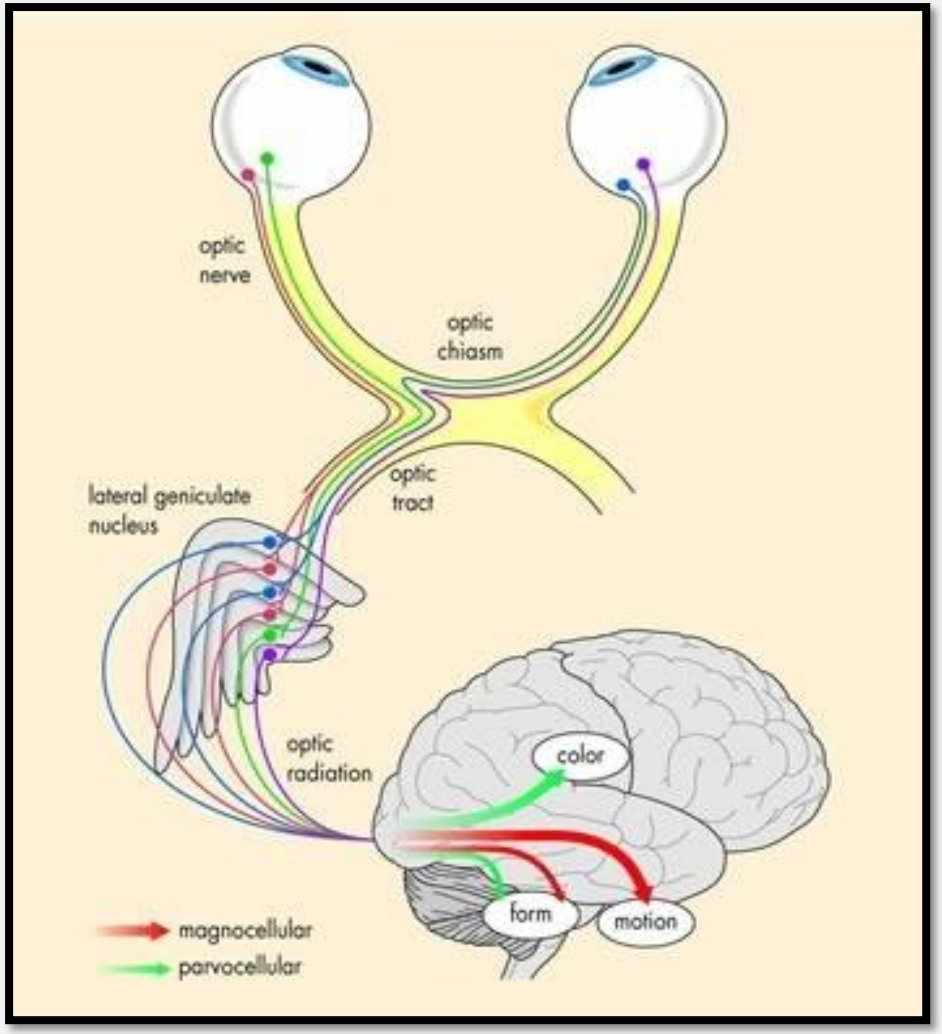
Amblyopia

Amblyopia



- It is usually unilateral but may be bilateral.
- Amblyopia itself produces no change in the appearance of ocular structures.

Etiology

1-Strabismus.

2-Anisometropia(A large difference in refractive errors usually > 1.5 diopters) between the two eyes.

- **3-** <u>Organic causes</u>: a unilateral cataract, corneal scar, may cause a preference for the other eye and thereby cause amblyopia.

4-<u>Occlusion</u>: that occur in the fellow eye as a result of too much patching or excessive use of atropine.

Treatment

- Patient younger than 10 years:
- Full cycloplegic correction in both eyes symmetrically > 1.5 D.
- Patching: patch the sound eye with better corrected vision 2-6 hours/day for 1 week per year of age.

- Patient>10 years :

  A trial of spectacle correction, patching and/or atropine may be considered.

  If treatment of amblyopia fails, protective glasses should be worn to prevent accidental injury to the non amblyopic eye

Test for sensory anomalies part 1

Bagolini striated glasses


3
4
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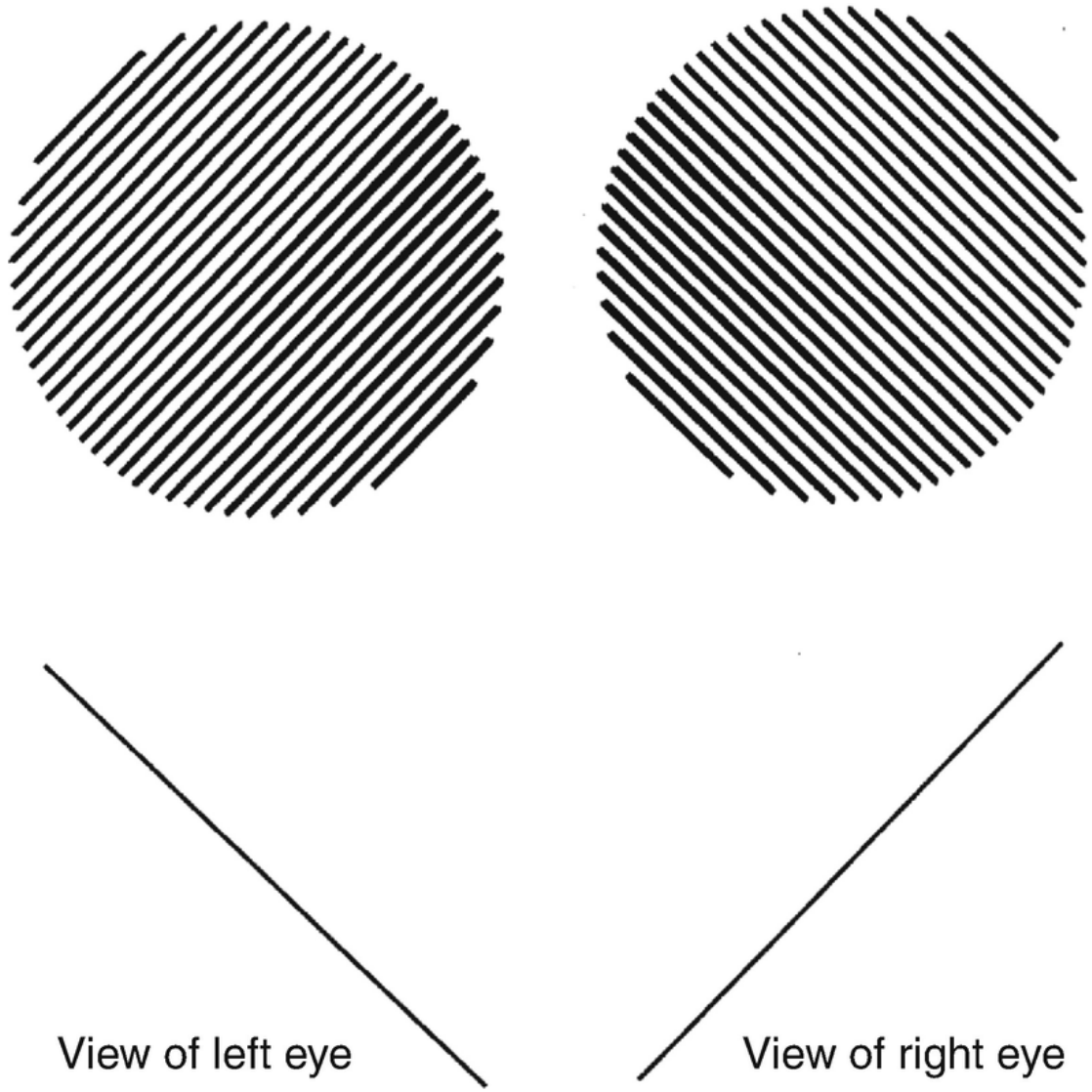
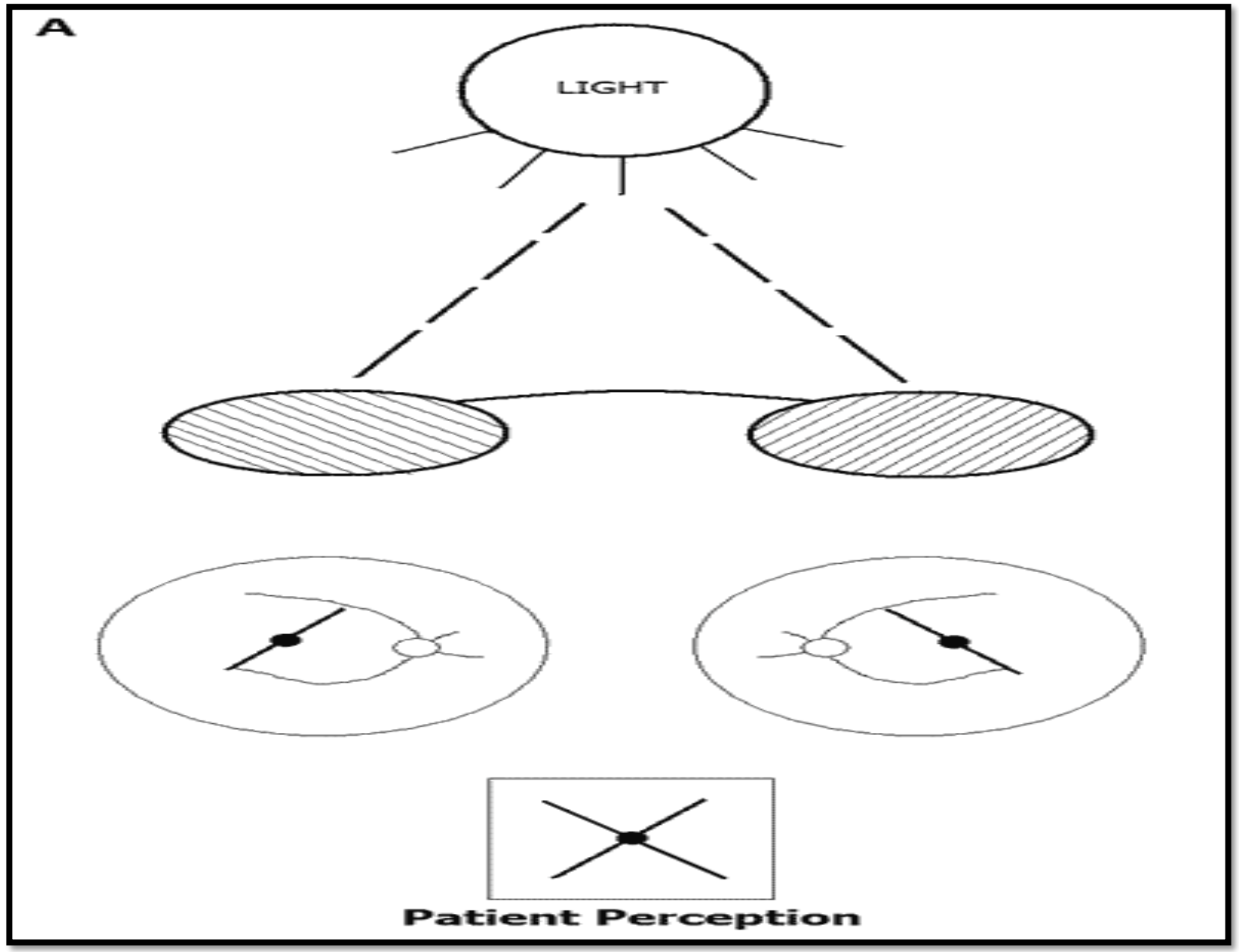
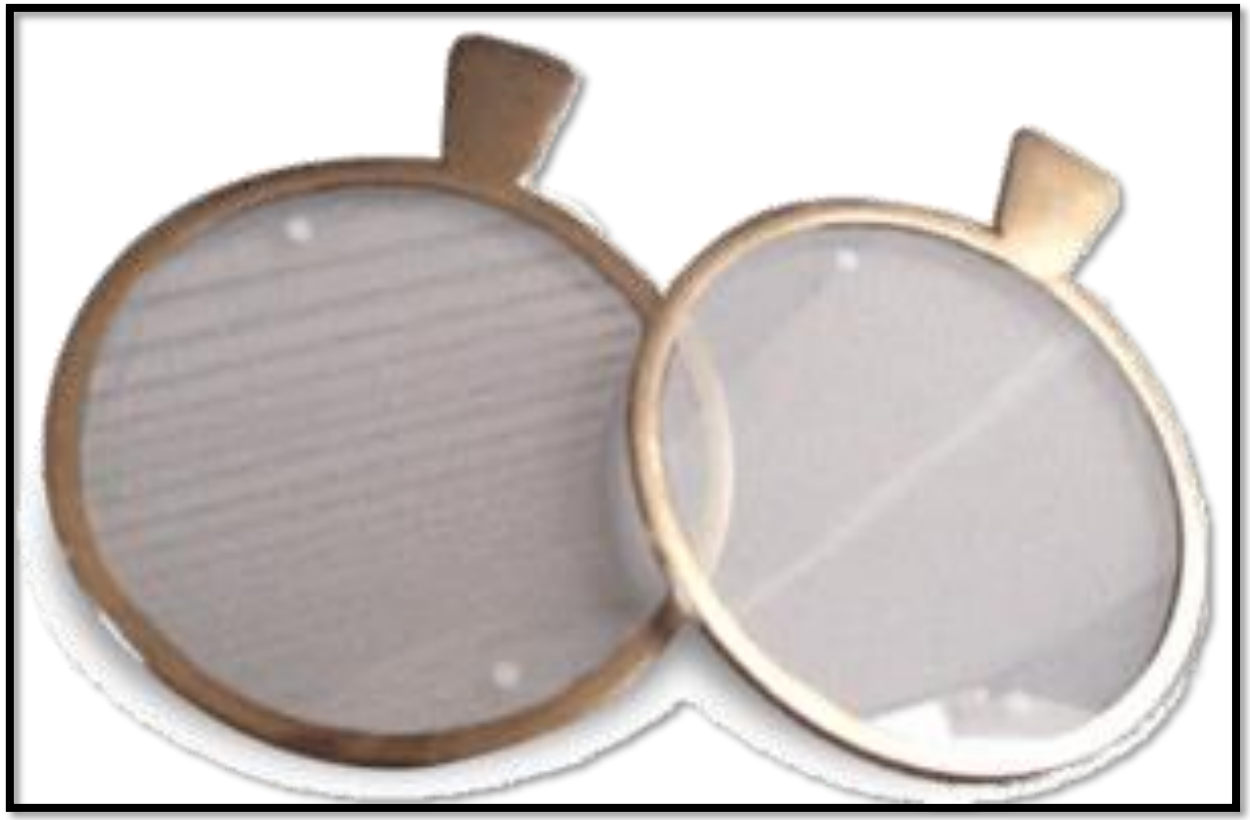
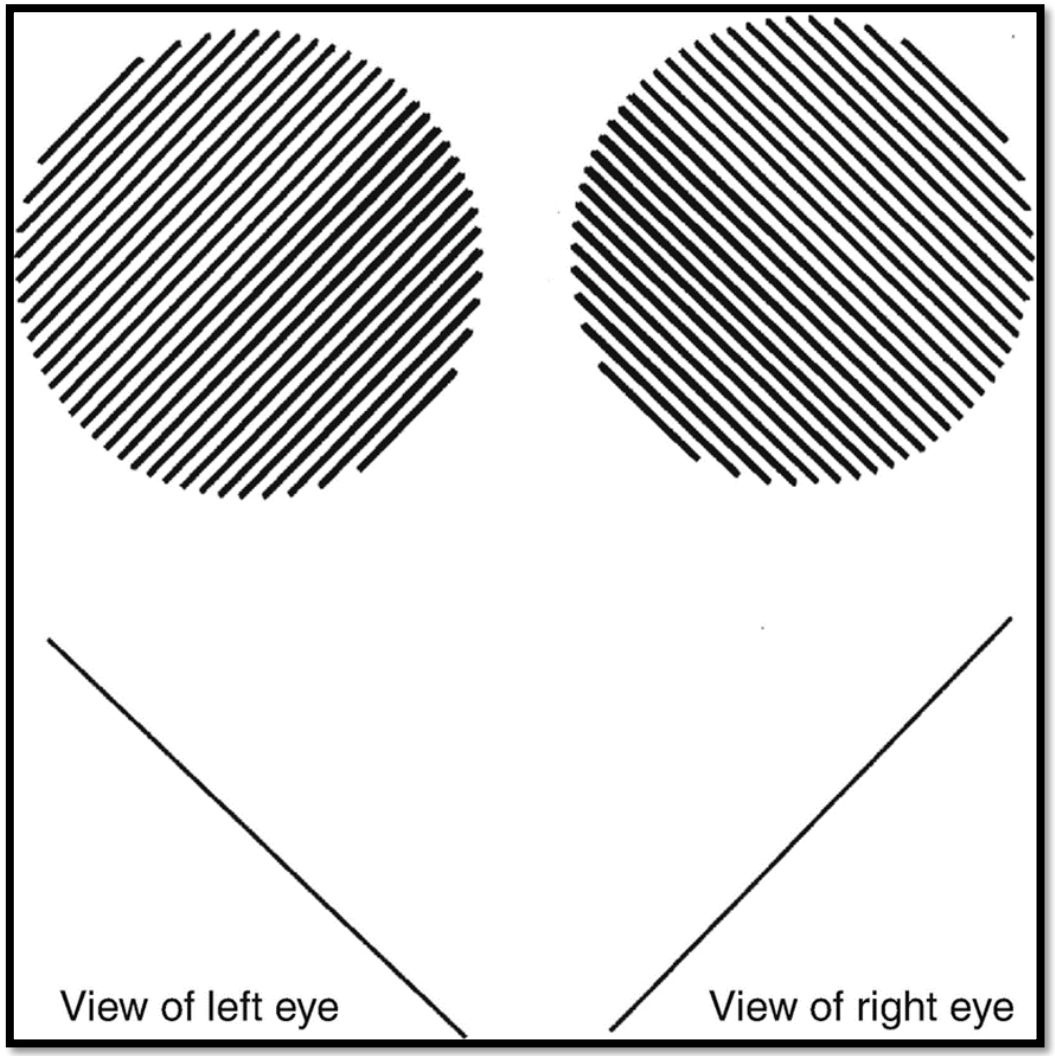
mm


View of left eye
View of right eye


A
LIGHT
Patient Perception



- Each lens has fine striation which convert a point source of light into a line, as with the Maddox rod.



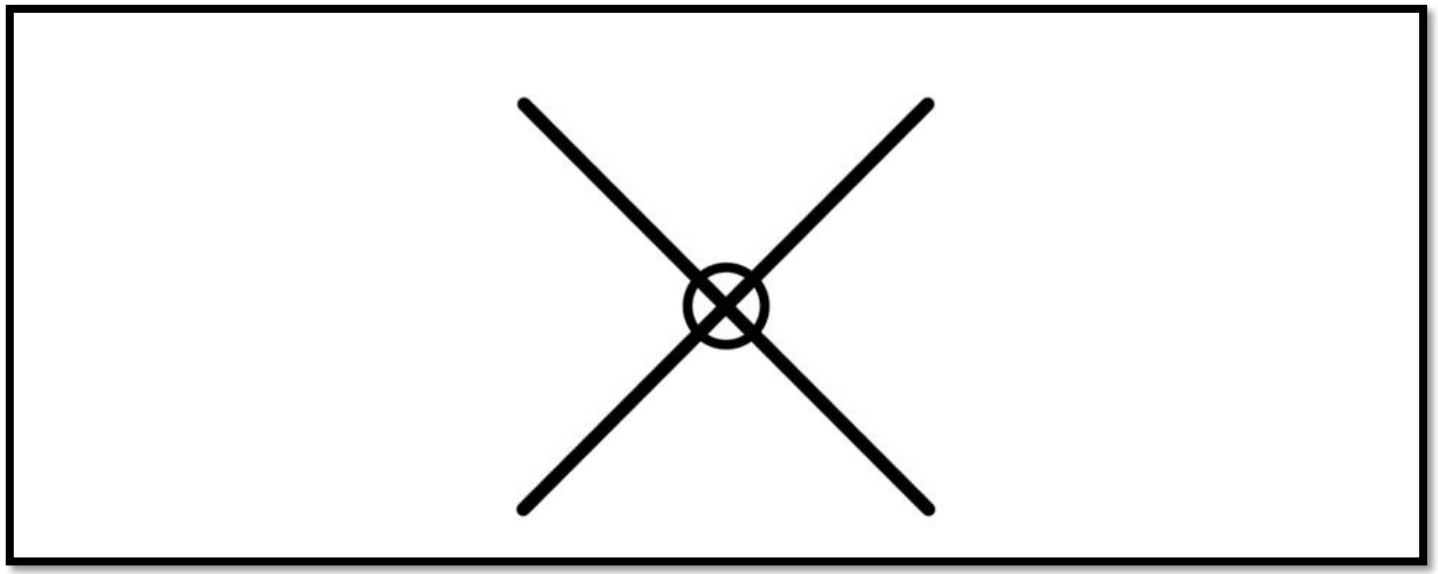
Procedure

- The two lenses are placed at 45 and 135 in front of each other and the patient fixate a small light source.

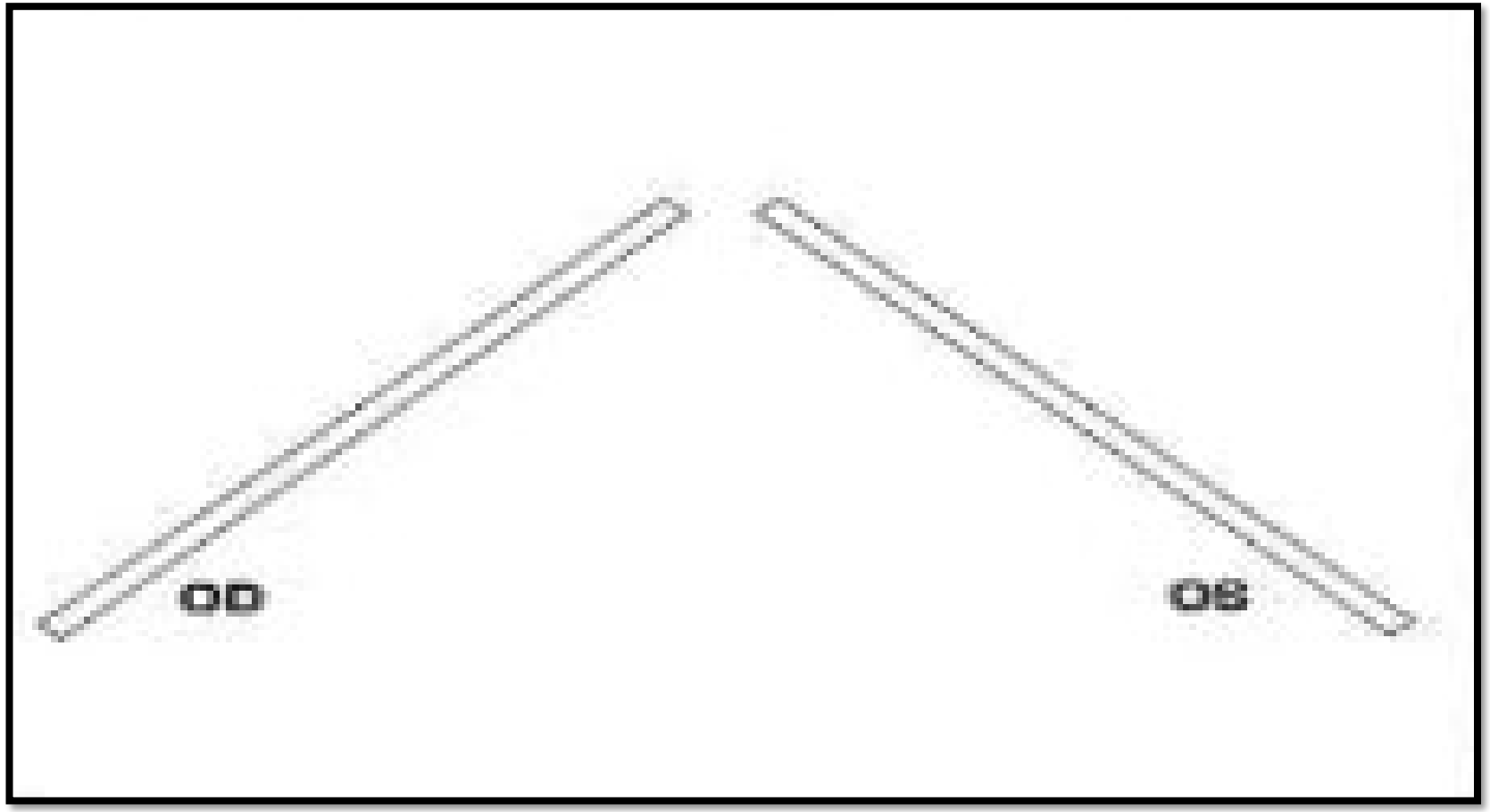
- Each eye perceive an oblique line of light, perpendicular to what perceived by the fellow eye.

Results

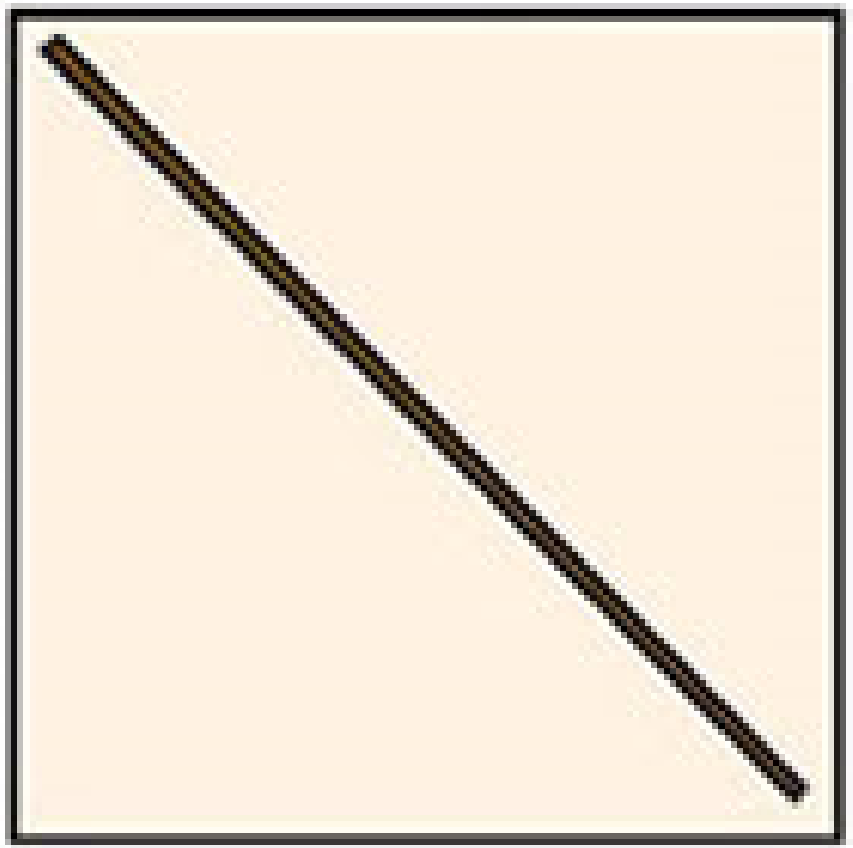
- If the two streaks intersect each other at their center in a form m of oblique cross X, the patient has binocular single vision (BSV).



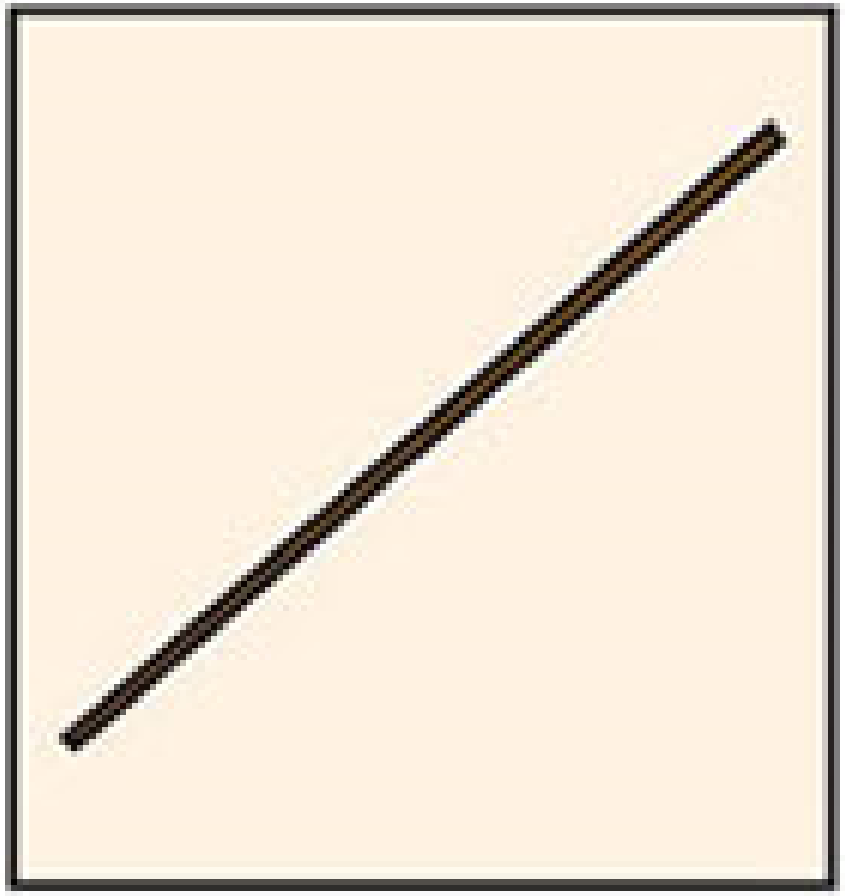
- If the two lines are seen but don t form a cross, diplopia is present.



- If only one streak is present , then suppression is present

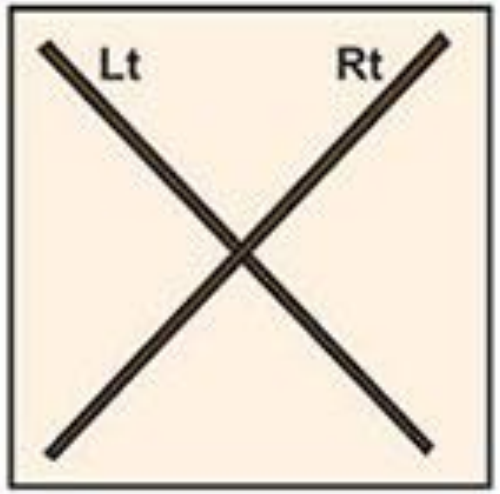


Right suppression

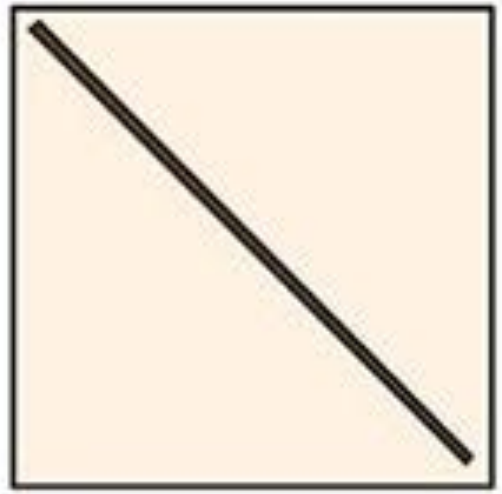


Left suppression

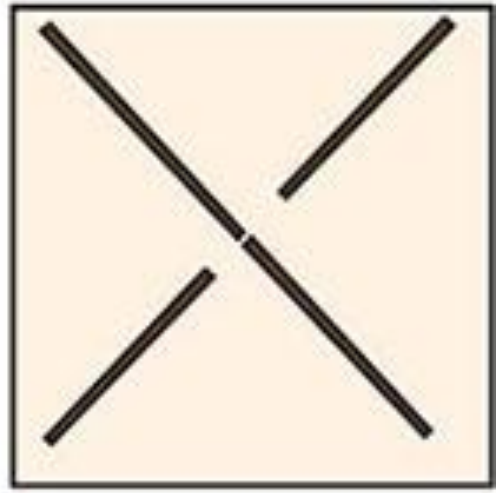
Bagolini striated glasses test



Normal/HARC with squint



Right suppression



Right central scotoma

Left suppression

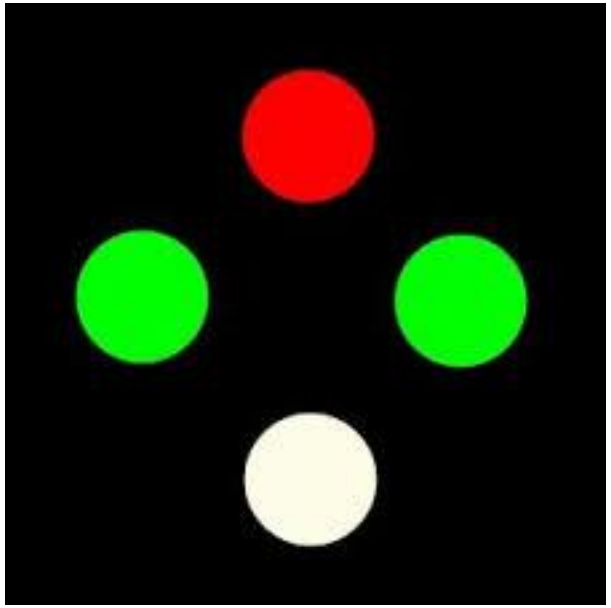
Tests for sensory anomalies

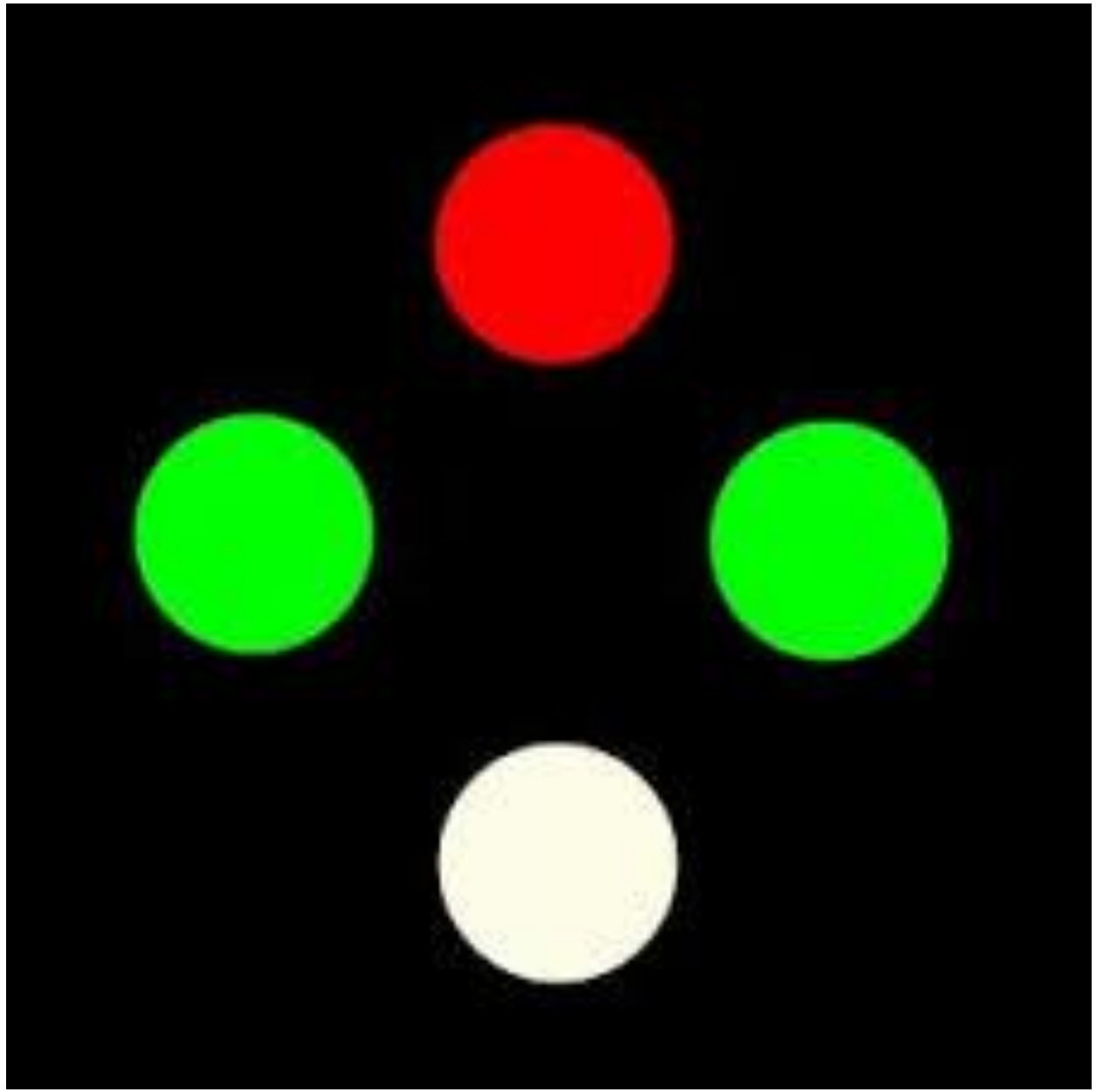
Worth four-dot


6 m

- This is a dissociation test used for both distance and near.

- The patient wears a green lens in front the right eye, and a red lens in front the left eye.
- The patient view a four lights:
- One red
- Two green
- One white

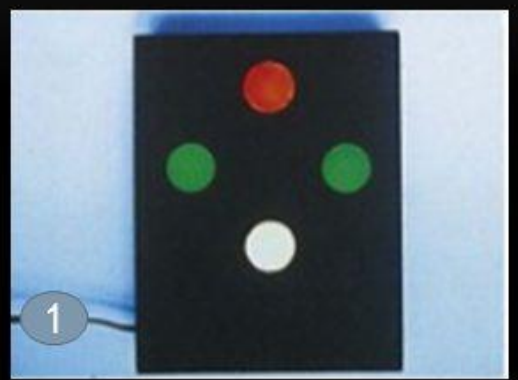


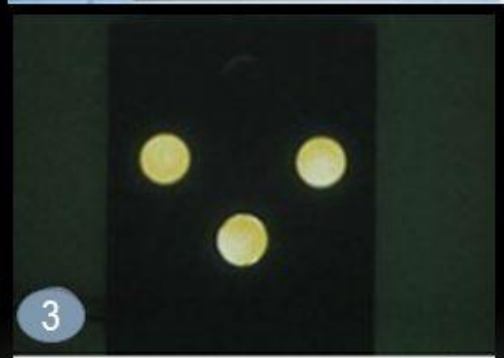


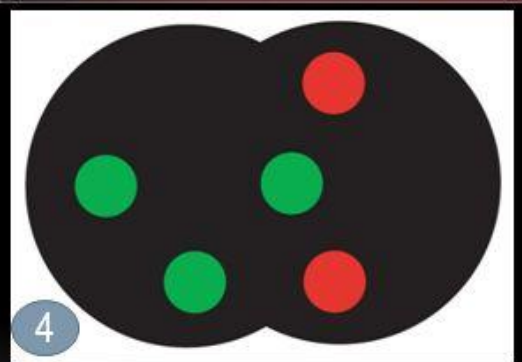
results

- If binocular single vision: all four lights are seen.
- If two red lights seen : right suppression is present.
- If three green lights are seen : left suppression is present.
- If two red and three green light are seen: diplopia is present
- If the green and red lights alternate: alternate suppression is present.

WORTH'S 4 DOT TEST
WHAT ARE THESE RESULTS

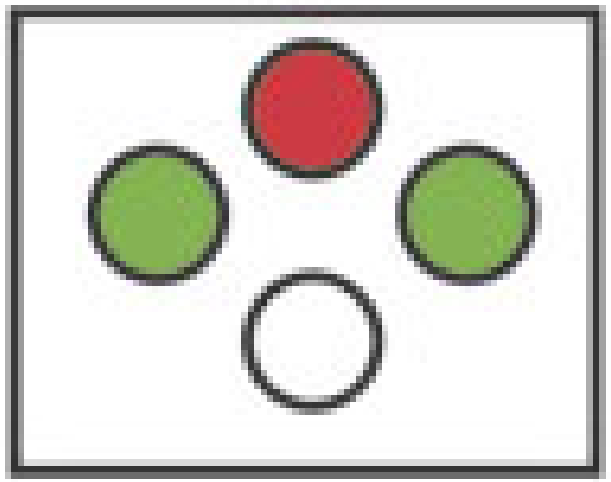


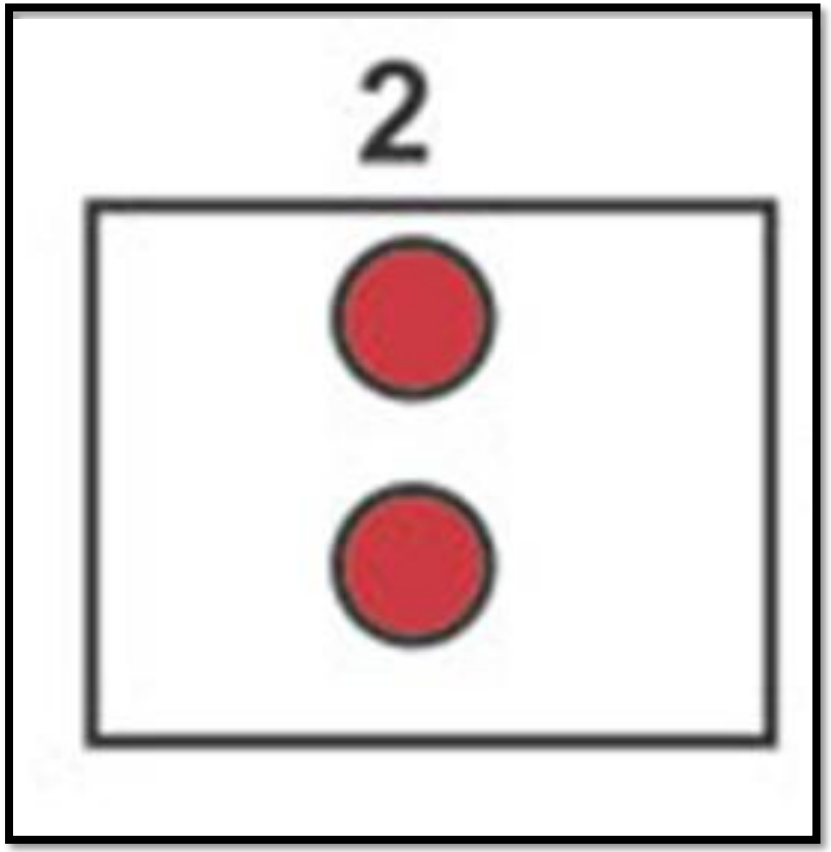




Box with four lights

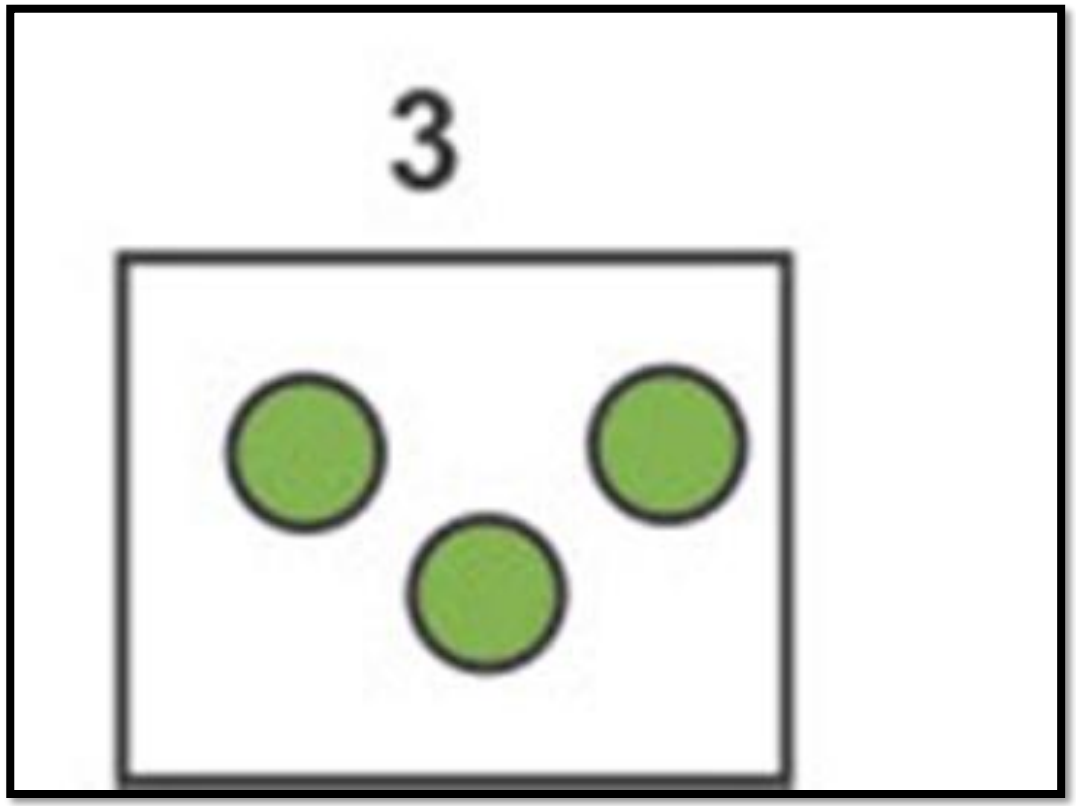
1

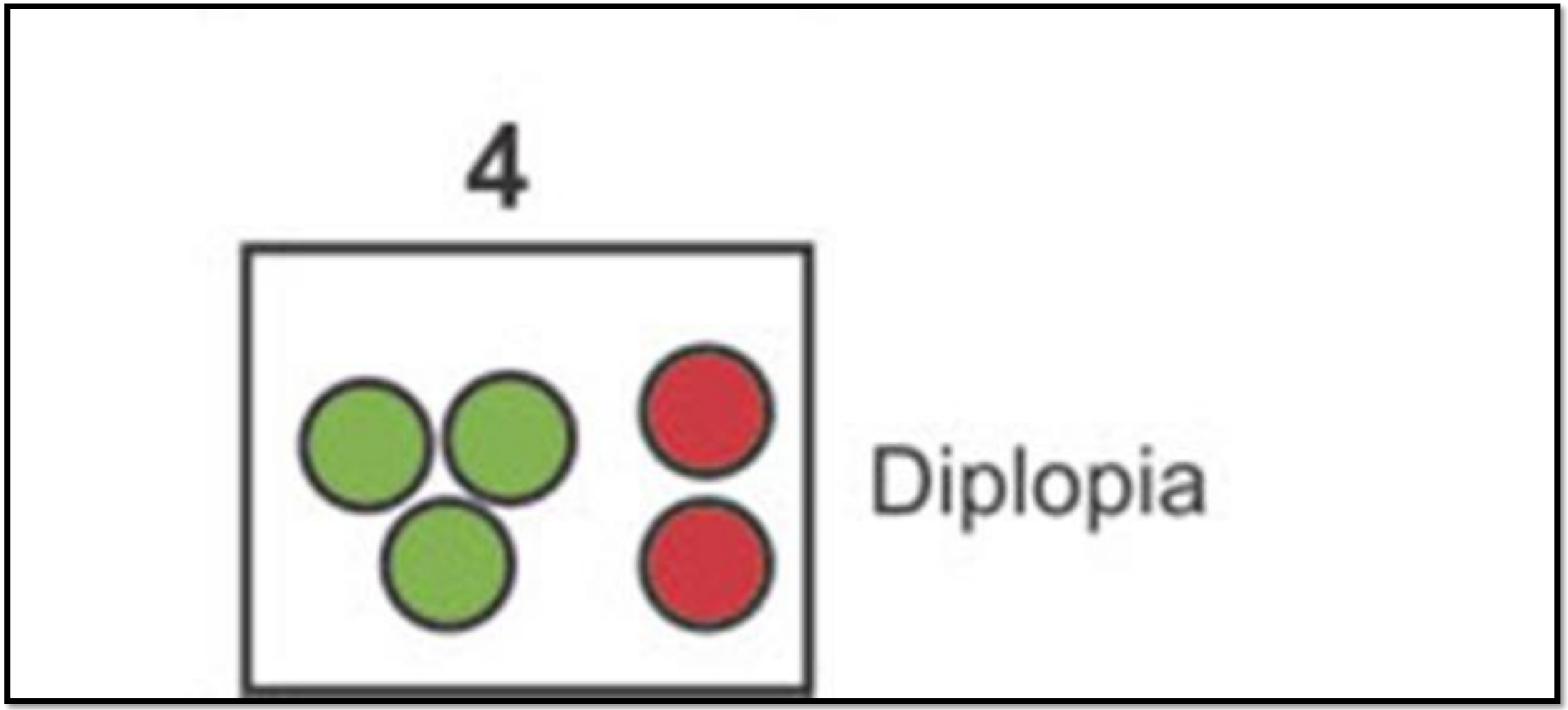




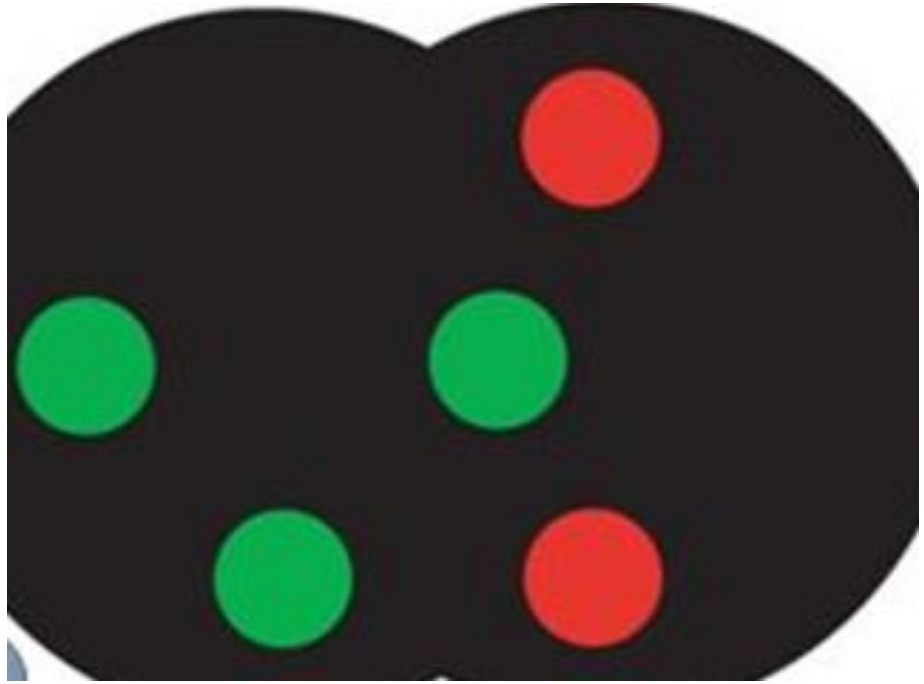
Right Supression

Left supression




4
Diplopia

Alternate suppression



Squint Assessment

- 1- Motor assessment
- 2- Sensory assessment

Motor assessment

Measurement of deviation

Hirschberg test

Kirmsky test

Buckner test

1- Cover test
2- Uncover test
3- Prism cover test
4- Maddox rod
5- Maddox wing

Motility test

A- Ocular movement
1- version
2- Duction

B- Near point of convergence
C- Near point of Accommodation
D- Fusional Amplitude
E- post operative diplopia test

Sensory assessment

1- history

2- visual acuity

3- test for stereopsis

4- test for binocular single vision

5-Worth 4- dot test

6- Bagolini striated glasses

7- Synoptophore

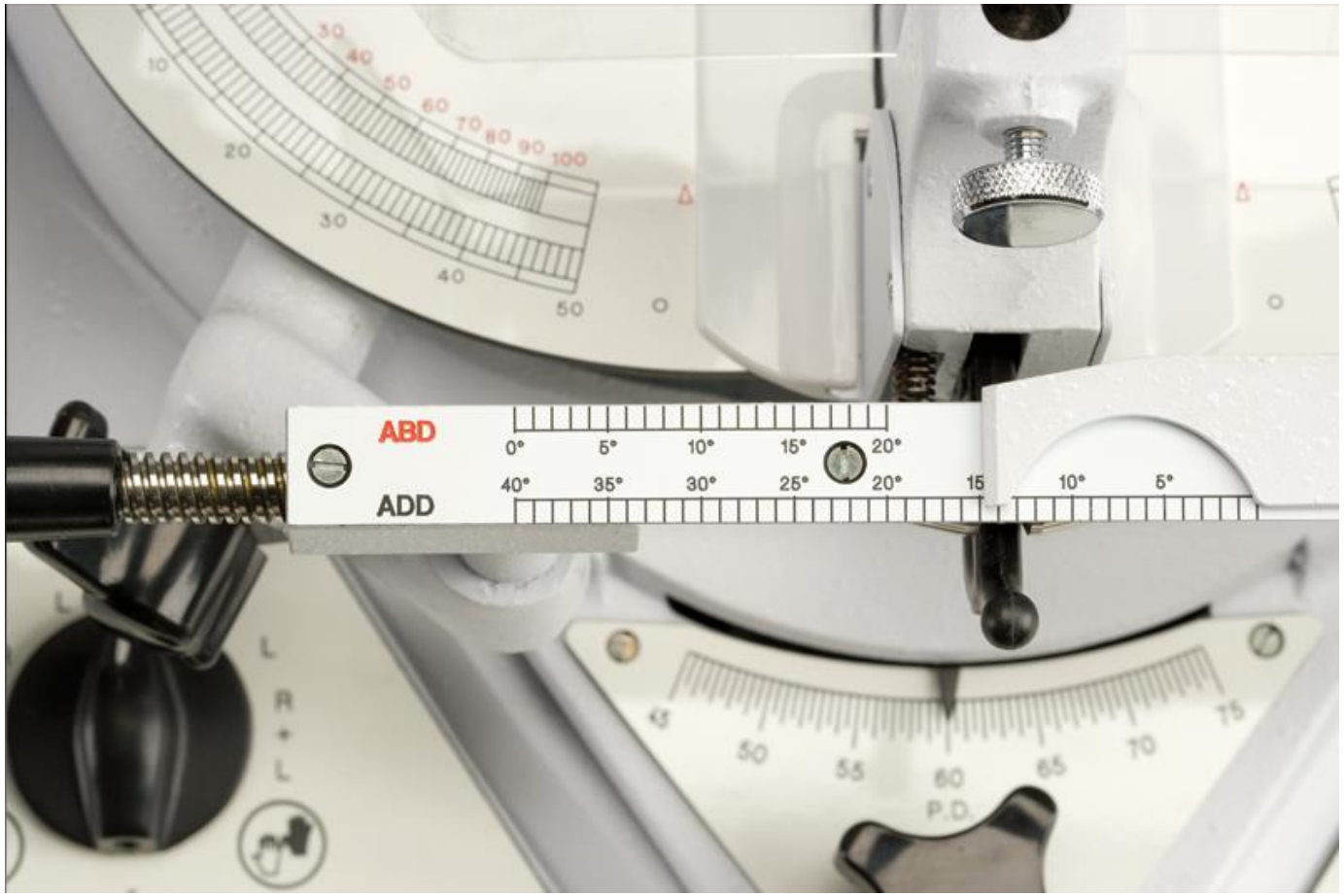
Tests for sensory anomalies part- 3

Synoptophore

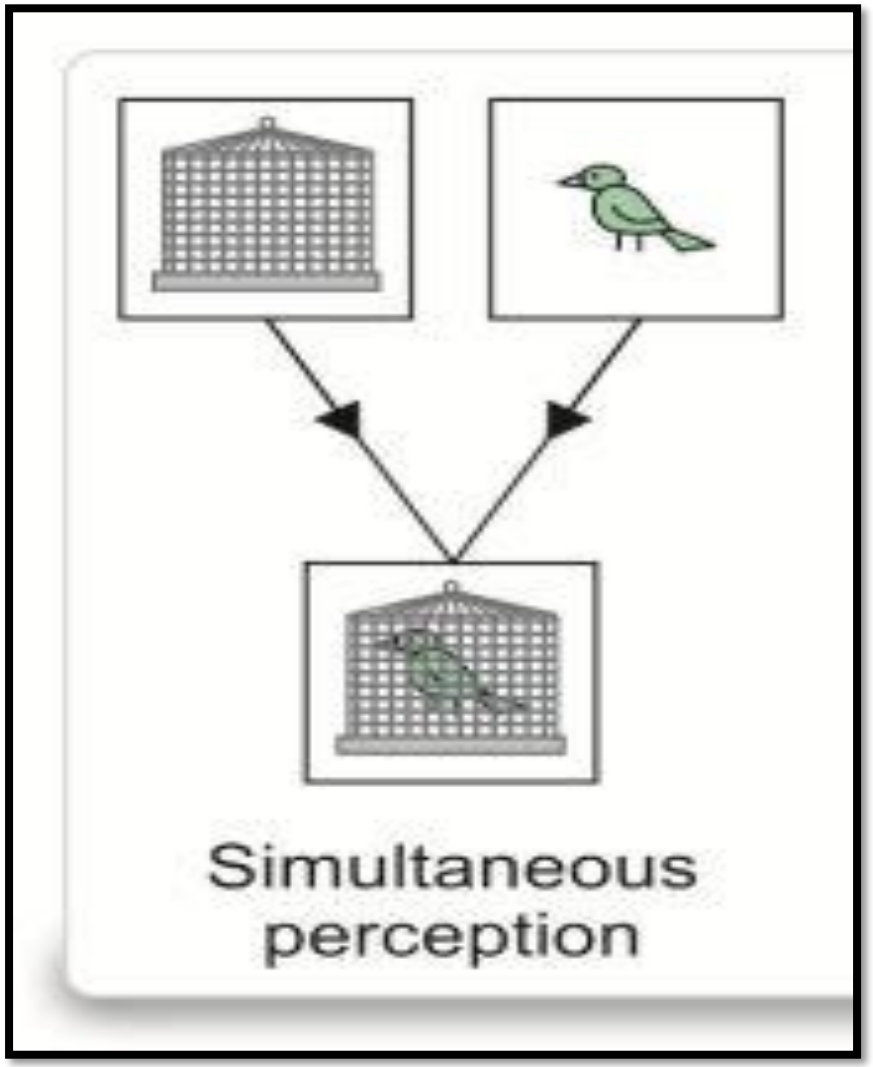
- The synoptophore compensate for the angle of squint and allows stimuli to be presented to both eyes simultaneously.
- It can thus be used to investigate the potential for binocular function in the presence of manifest squint and of particular value in children from age of 3 and above.

- The instrument consist of 2 cylindrical tubes right-angled bend and +6.5 D lens in each eyepiece. This optically set testing distance as equivalent for about 6 meters.

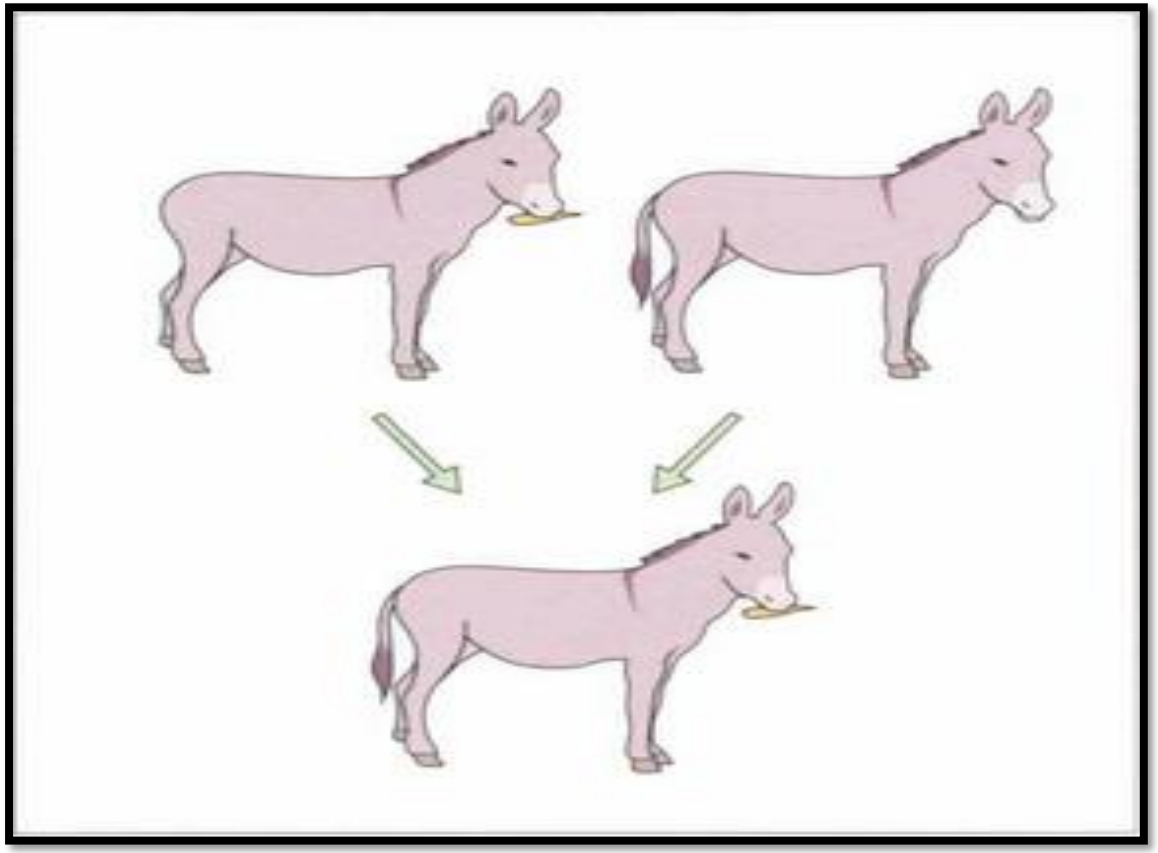
- The synoptophore can measure horizontal, vertical and torsional misalignments simultaneously and is valuable in determining surgical approach by assessing different contribution in the cardinal position of gaze.



- First grade: **simultaneous perception**.
- If the two images can not be seen simultaneously : suppression is present.

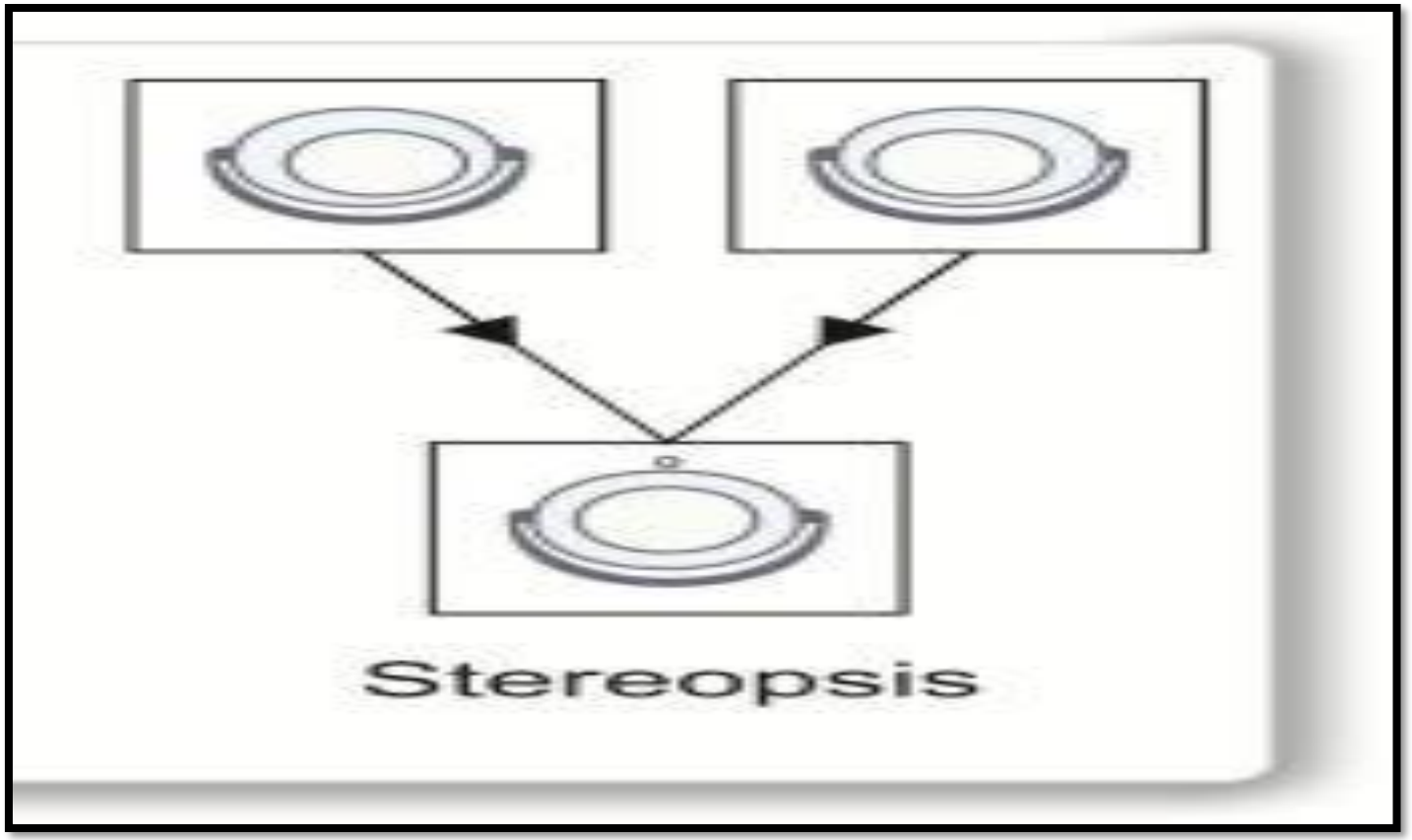


- Second grade: **fusion**
- If simultaneous perception slides can be superimposed then the test proceeds to second grade which is the ability of two eyes to produce composite picture(sensory fusion) from two similar images, each of one is incomplete in one small different details.

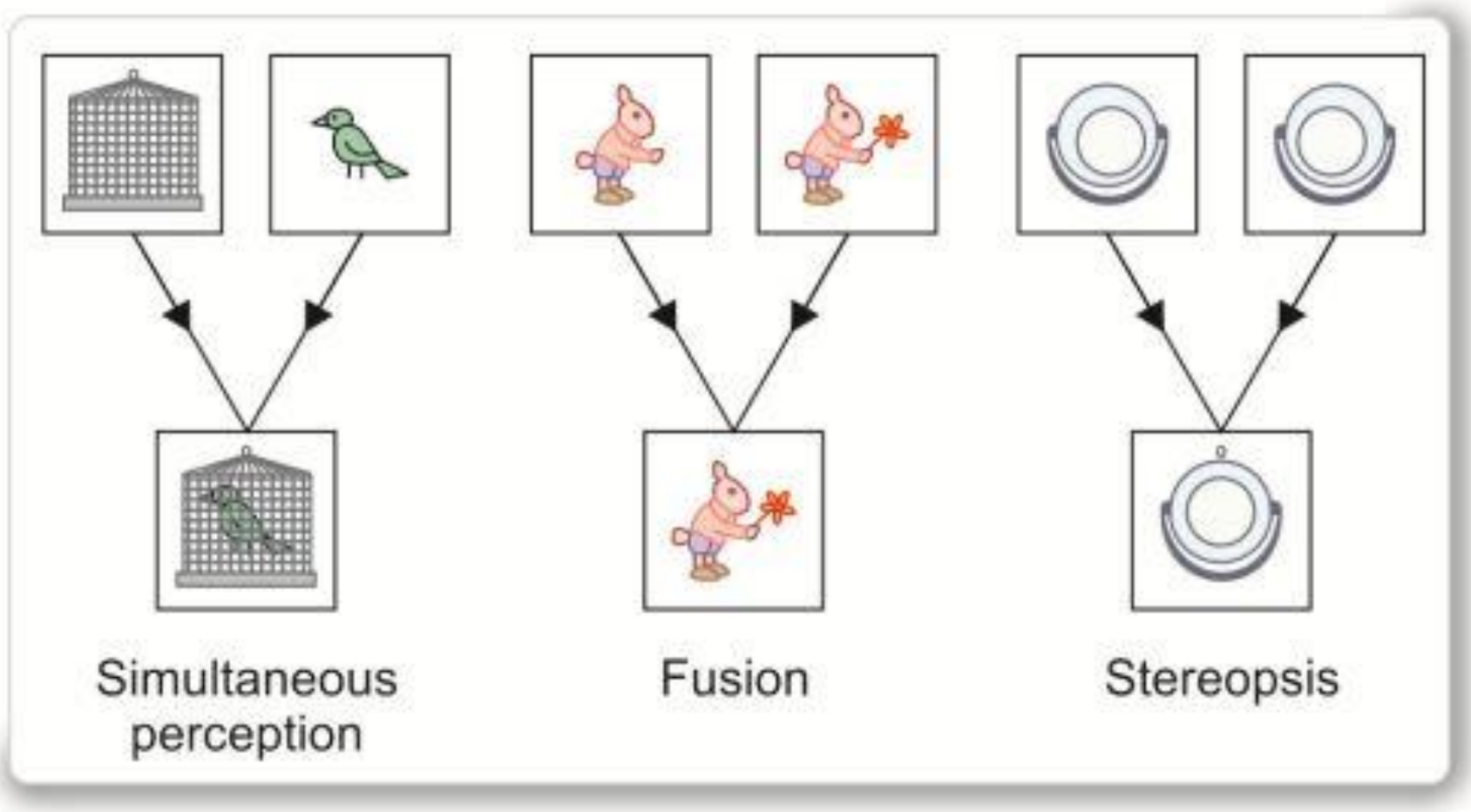


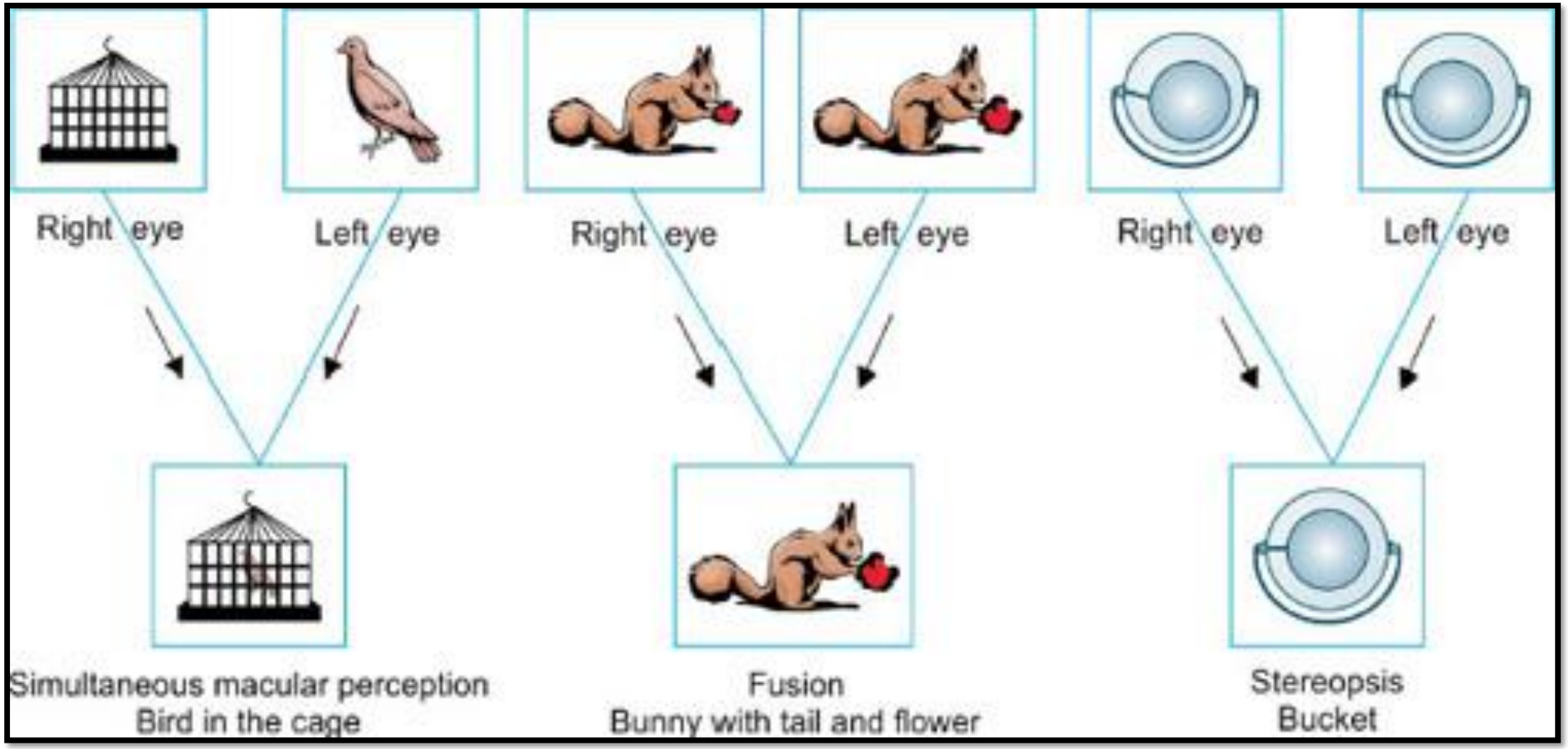
- Third grade : **stereopsis**

- Ability to get impression of depth by superimposition of two pictures of the same object which have been taken from different angle



Grades of binocular vision




Right eye
Left eye
Right eye
Left eye
Right eye
Left eye
Simultaneous macular perception
Bird in the cage
Fusion
Bunny with tail and flower
Stereopsis
Bucket

4

Exotropia

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Optometry Department
Alnoor University College

Pseudo-exotropia: due to large angle kappa (example :Retinopathy of prematurity)

Classification

- Exophoria: X
- Intermittent Exotropia: X (T)
- Exotropia: XT

Exotropia : clinical types

1. Congenital
2. Sensory
3. Typical Childhood, or intermittent exotropia
4. Convergence Insufficiency
5. Consecutive

Congenital Exotropia

- Rare
- Constant Exotropia
- Large angle
- Often associated with other neurologic defects
- Only treatment is surgical

Sensory Exotropia

- Poor vision in one eye leads to exotropia
- Sensory esotropia or exotropia may occur
- Causes
  - Marked anisometropia
    - E.g., unilateral high myopia
- Retinoblastoma (22% present with strabismus)
- Unilateral cataract

Sensory Exotropia: Treatment

1. Treat underlying cause if possible
   - E.g. remove cataract, treat amblyopia
1. Surgery for exotropia
   - Fusional outlook variable
   - Small XT often best left alone

Typical Childhood Exotropia or Intermittent Exotropia

- Onset 6 months to 6 years of age
- Average refractive errors
- Deviation usually noted first with distance vision
- Often normal sensory pattern when eyes aligned
- Many progress through different phases
- Some remain stable and do not progress

Progression of Exotropia

- Phoria → Tropia
- Distance deviation> Near deviation
- Progression more rapid under age 6, but progression in adulthood common also(may present with diplopia)

Non Surgical Treatment of Exotropia

1. Maximize vision
   - Glasses especially for myopia
   - Treat amblyopia
1. Minus lenses
2. Base in prism with or without minus lenses
3. Orthoptics
   - Mainly useful for convergence insufficiency with Ex=0, X' or X(T)'
5. Part time patching: may improve control

Surgery for Exotropia

- Usually recess LR OU as initial operation
- Convergence insufficiency with XT distance less than XT at near:
  - Recess one LR, Resect one MR
- Poor vision in one eye
  - Recess LR, Resect/Tuck MR of eye with reduced vision

Cyclovertical deviation

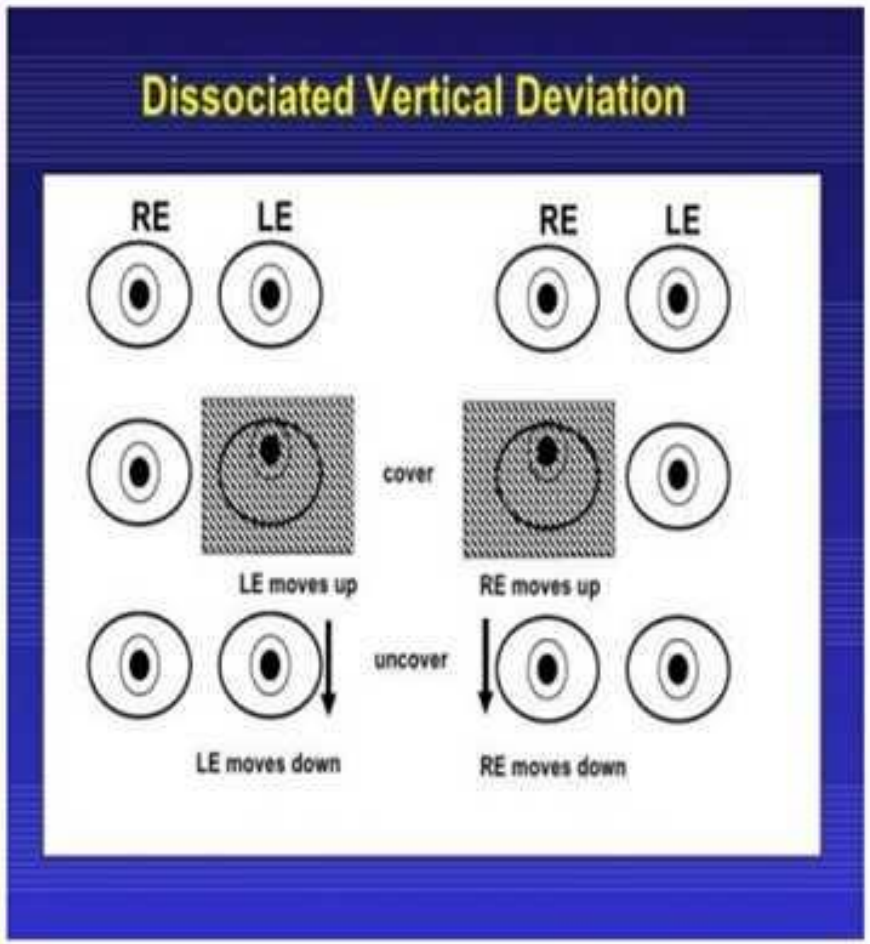
Dissociated Vertical deviation (DVD)

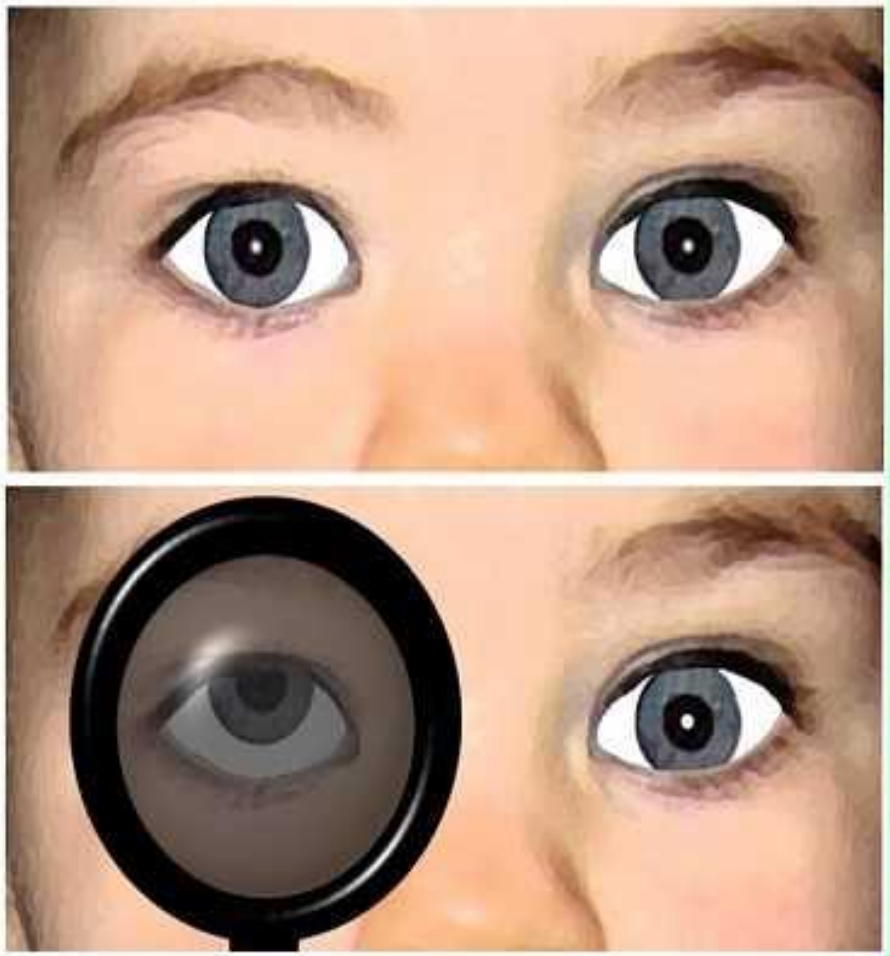
- What is Dissociated Vertical Deviation (DVD)?

- DVD is **a condition in which one eye drifts upward** when it is not being used.
- The eye may drift upward either frequently or infrequently. The amount of drifting may vary during the course of the day.

- Etiology-
- 50% of patients with infantile esotropia
- Clinical features-
- Head tilt
- Excycloduction of the elevated eye and incycloduction of the fixating eye
- Latent nystagmus

Dissociated Vertical Deviation (DVD) in Eyes





- **Diagnostic test**

1. Spielmanns translucent occluder
2. Bielschowsky phenomenon
3. Red filter test

- **Measurement**
- Using Red filter
- Using base down prism

Inferior Oblique overaction

- In primary inferior oblique muscle overaction, **an upshoot of the adducting eye occurs when gaze is directed into the field of action of the inferior** oblique muscle, producing a greater upward excursion of the adducted eye than of the abducted eye.

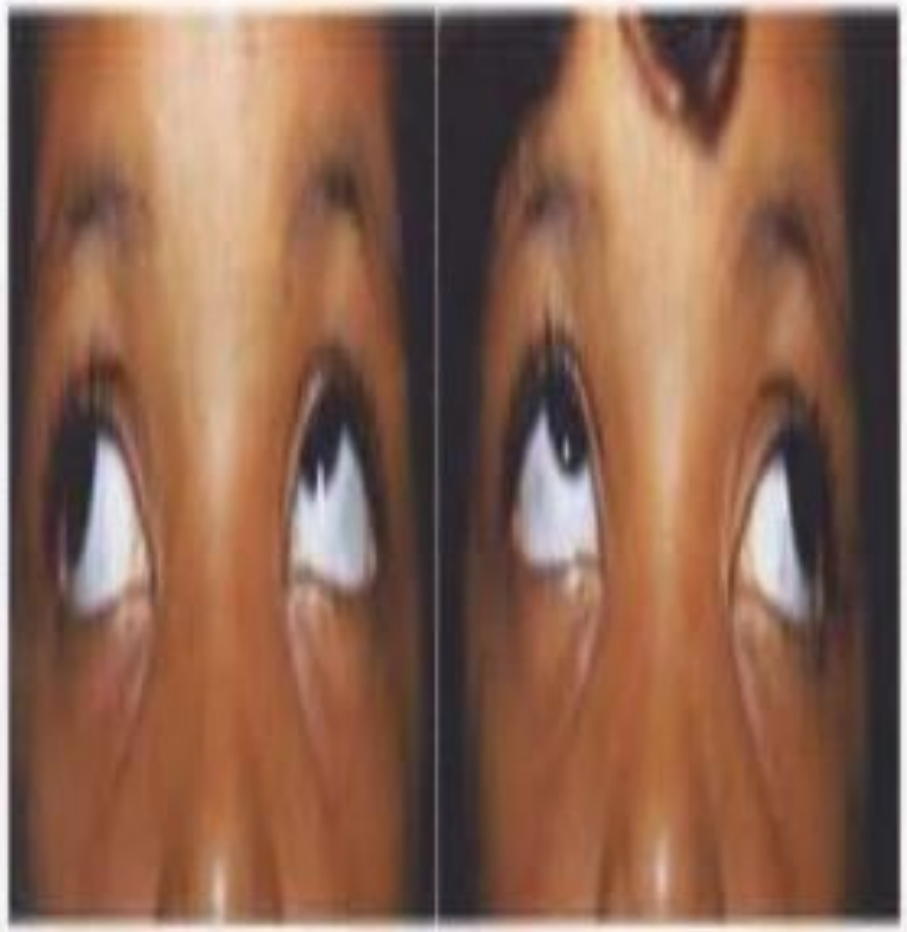

A
B
C

Inferior Oblique Muscle Over action

- **Etiology**

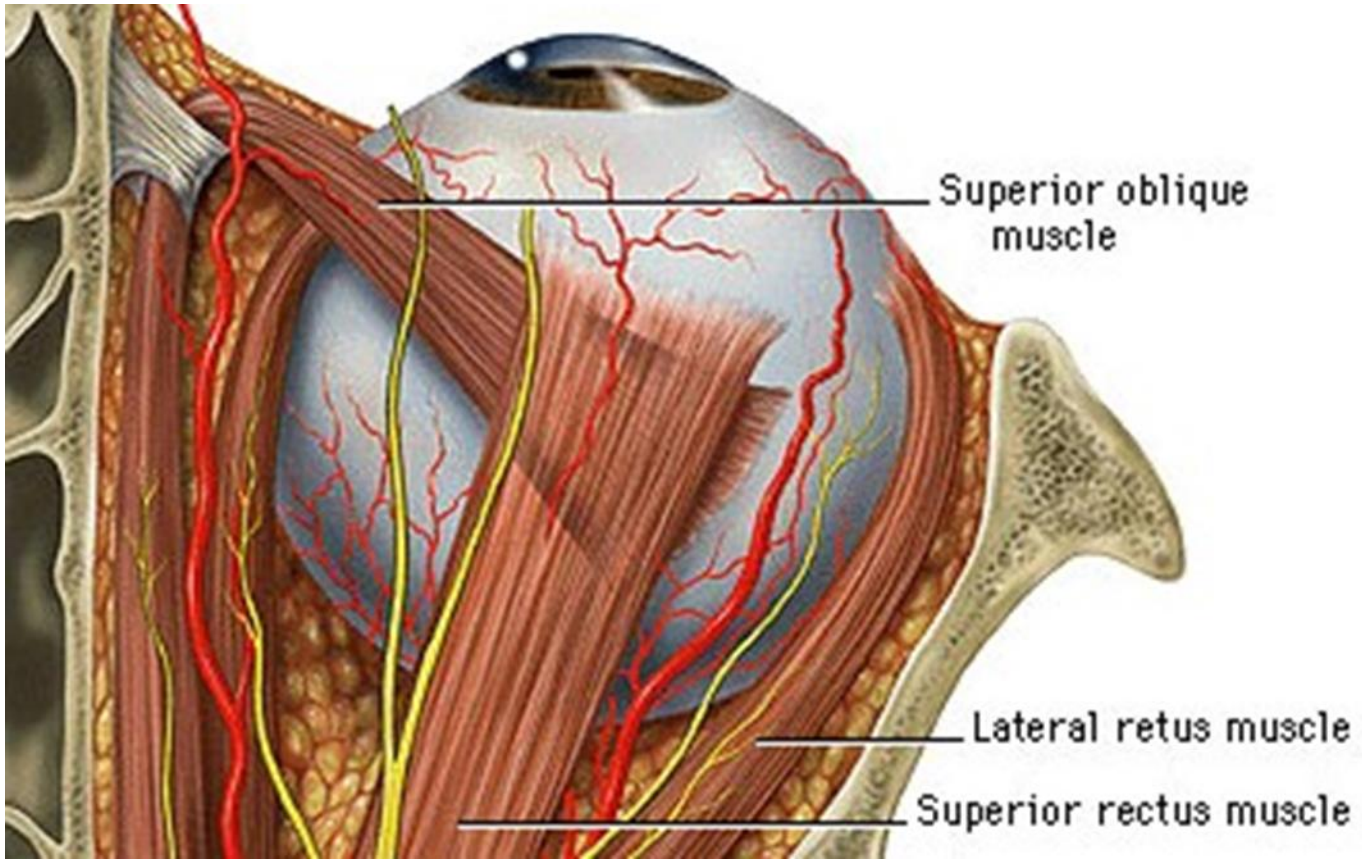
1. Primary
2. Secondary

- **Clinical Features**
- **Management**
- Weakening procedure on the inferior oblique muscle

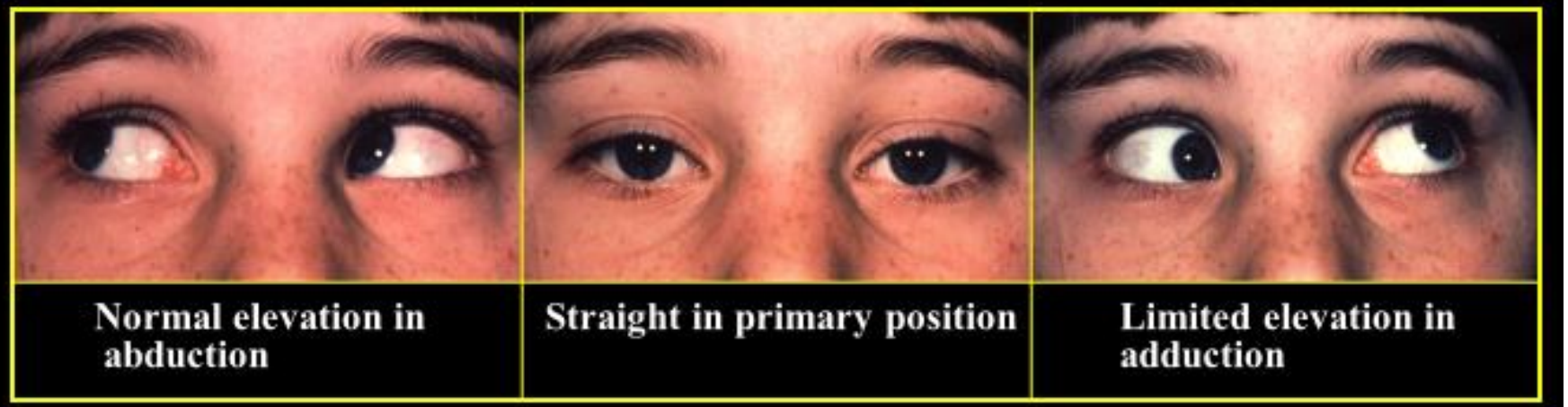


Brown Syndrome

- Brown syndrome is **a problem with the tendon that attaches to the outside of the eye (superior oblique muscle tendon)**.
- In Brown syndrome, this tendon can't move freely. This limits the eye's normal movements. The superior oblique muscle is responsible for: Pulling the eye toward the midline.



Brown syndrome (right)



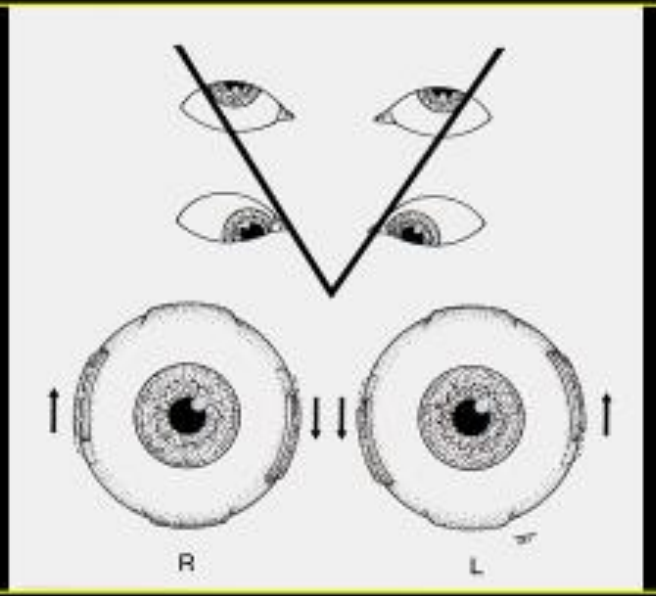
Normal elevation in abduction	Straight in primary position	Limited elevation in adduction

‘V’ pattern deviation

Signs

- Difference between up- and downgaze is 15△ or more

Treatment



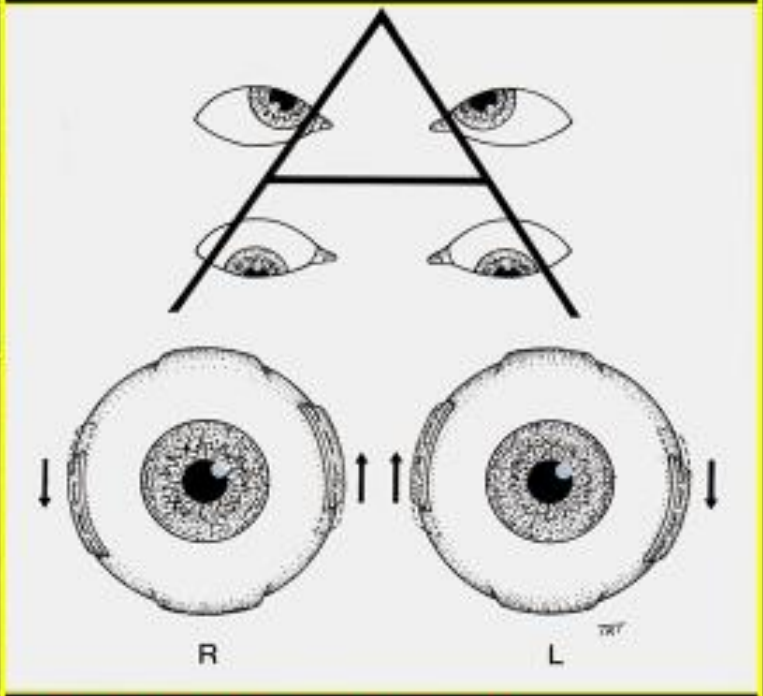
‘V’ pattern esotropia

- Bilateral medial rectus recessions + downward transposition

‘V’ pattern exotropia

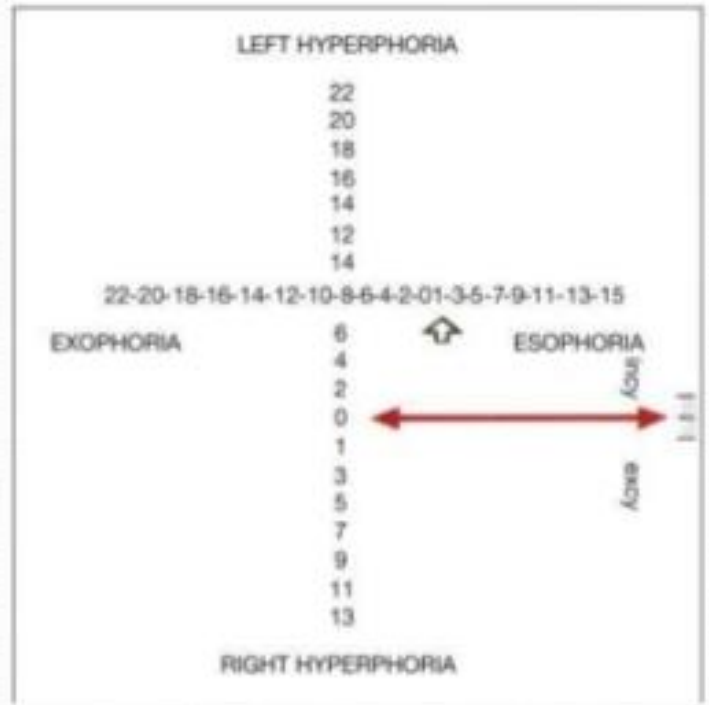
- Bilateral lateral rectus recessions + upward transpositions

‘A’ pattern deviation

Signs	Treatment
	
· Difference between up- and downgaze 10 or more	**‘A’ pattern esotropia** · Bilateral medial rectus recessions + upward transposition **‘A’ pattern exotropia** · Bilateral lateral rectus recessions + downward transposition

Maddox wing

- The amount of cyclophoria is determined by asking the patient to move the red arrow so that it is parallel with the horizontal row of numbers



Double maddox rod

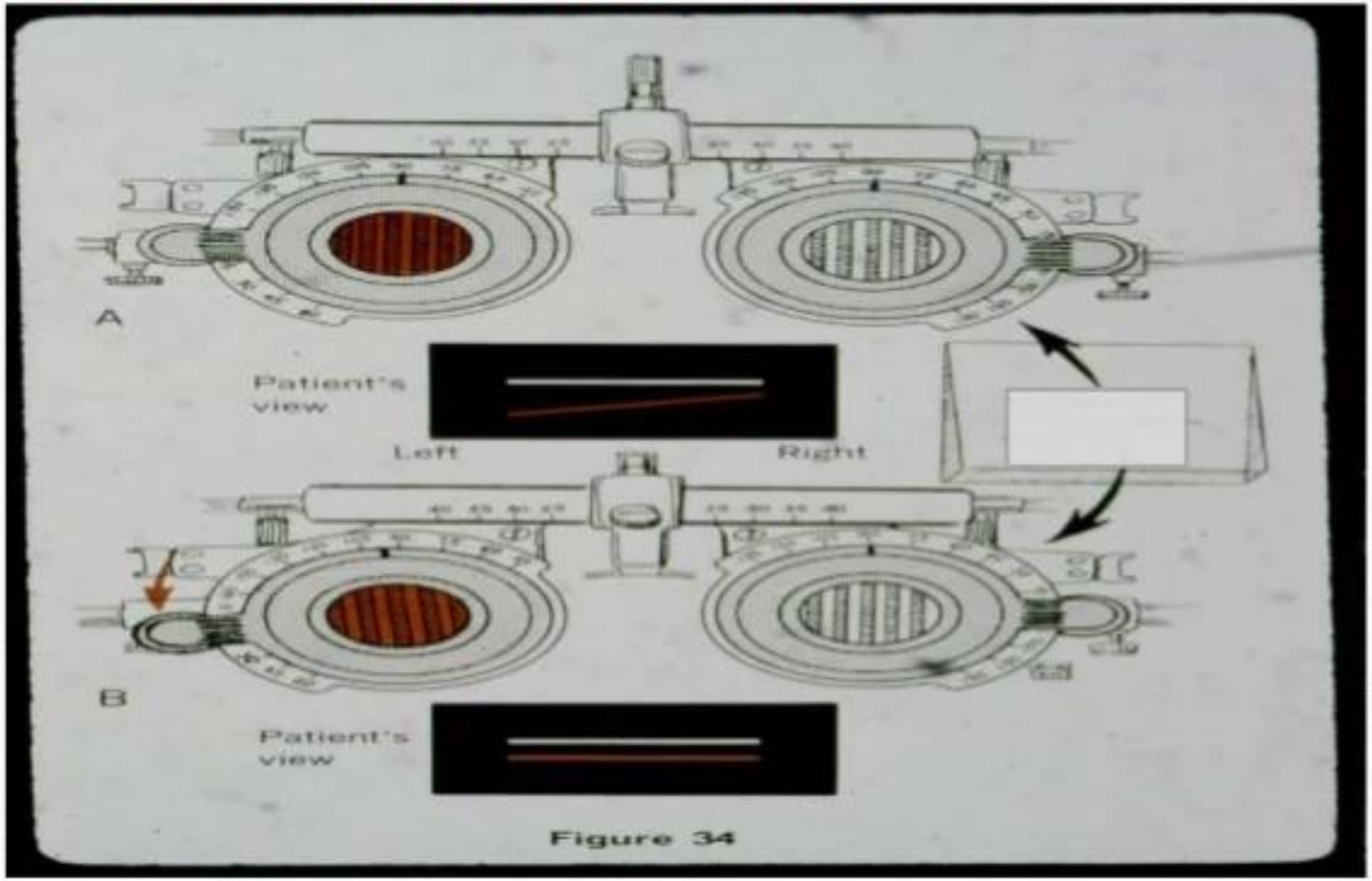


Figure 34

Motor assessment

Part 1

Cover-Uncover test

1- Cover test

- Used to detect tropia.
- The patient fixates a straight –ahead target.
- If right deviation is suspected, the examiner cover the fixing left eye and notes any movement of the right eye.
- No movement= orthophoria.
- Adduction of right eye= right exotropia.
- Abduction of right eye= right esotropia
- Downward movement =right hypertropia
- Upward movement= right hypotropia

Uncover test

- It detects phoria and it should be performed both for near and distance:
- Patient fixate a straight –ahead distance target.
- The examiner covers the right eye and after 2-3 seconds removes the cover

- No movement= orthophoria
- If right eye had deviated while under cover (re-fixation ,recovery) is observed.

- Adduction(nasal recovery)of right eye= exophoria.
- Abduction= esophoria.
- Upward movement or downward= vertical phoria.

Alternate cover test

Part 2

- Is a dissociation test which reveal the total deviation when fusion is suspended.

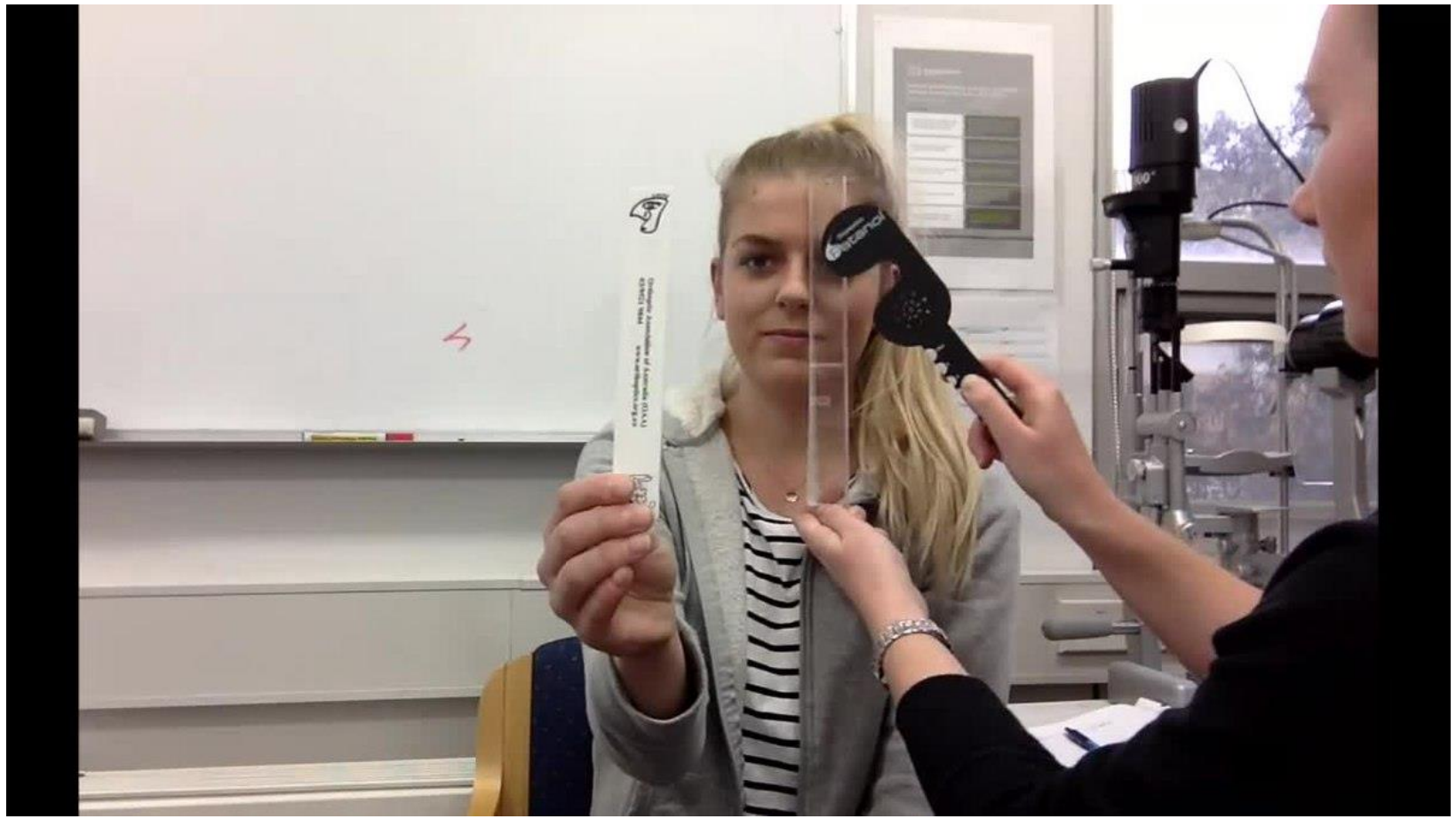
- It should performed after the cover-uncover test.

- The right eye is covered for several seconds.
- The occluder is quickly shifted to the opposite eye for 2 seconds then back and forth several times.

- After the cover is removed , the examiner notes the speed and smoothness of recovery as the eye return to their predissociation state.

- A patient with well compensated phoria will have straight eyes before and after the test has been performed whereas a patient with poor control may decompensated to a manifest deviation.

Prism cover test



Prism Bar Cover Test

Definition

- It measures near and distant angle in any gaze of deviation.
- It combined alternate cover test with prism.

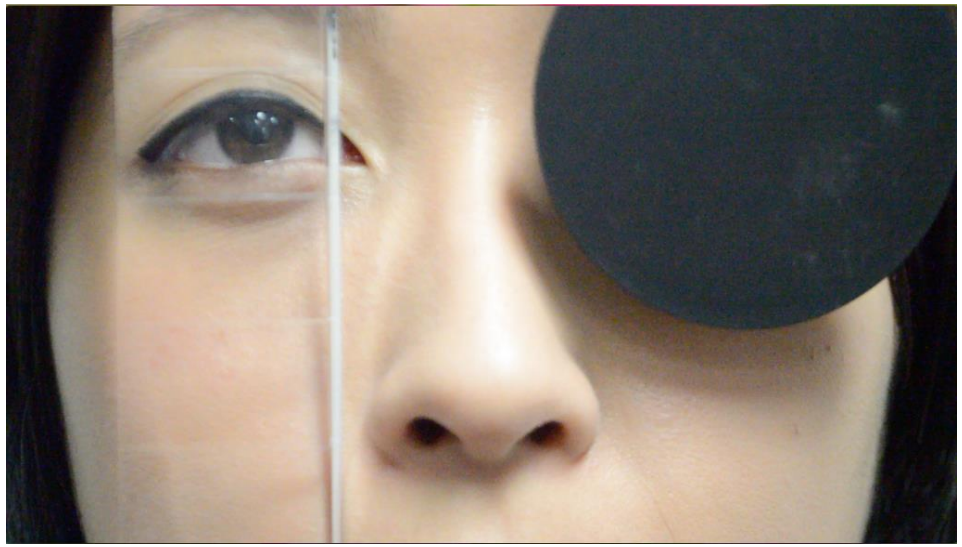
Procedure:

- The alternate cover test is first performed.
- A prism of increasing strength is placed Infront of the deviating eye (apex toward the deviation).

- The alternate cover test is continuously performed with prism application.

- The end point is approached when no movement is seen, to ensure maximum angle is found the prism strength is increased further until a movement is observed in opposite direction and reduced again to find the neutral value.

- The angle of deviation equal the strength of the prism.

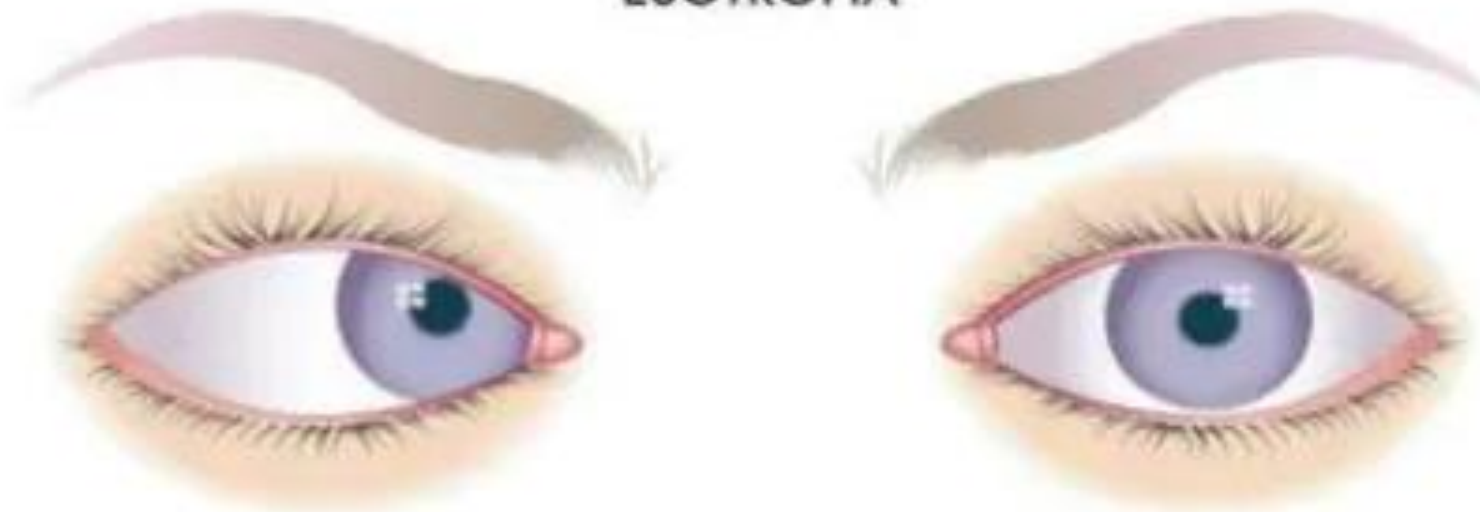


1

Squint (strabismus)

Dr. Azzam A. Ahmed

ESOTROPIA



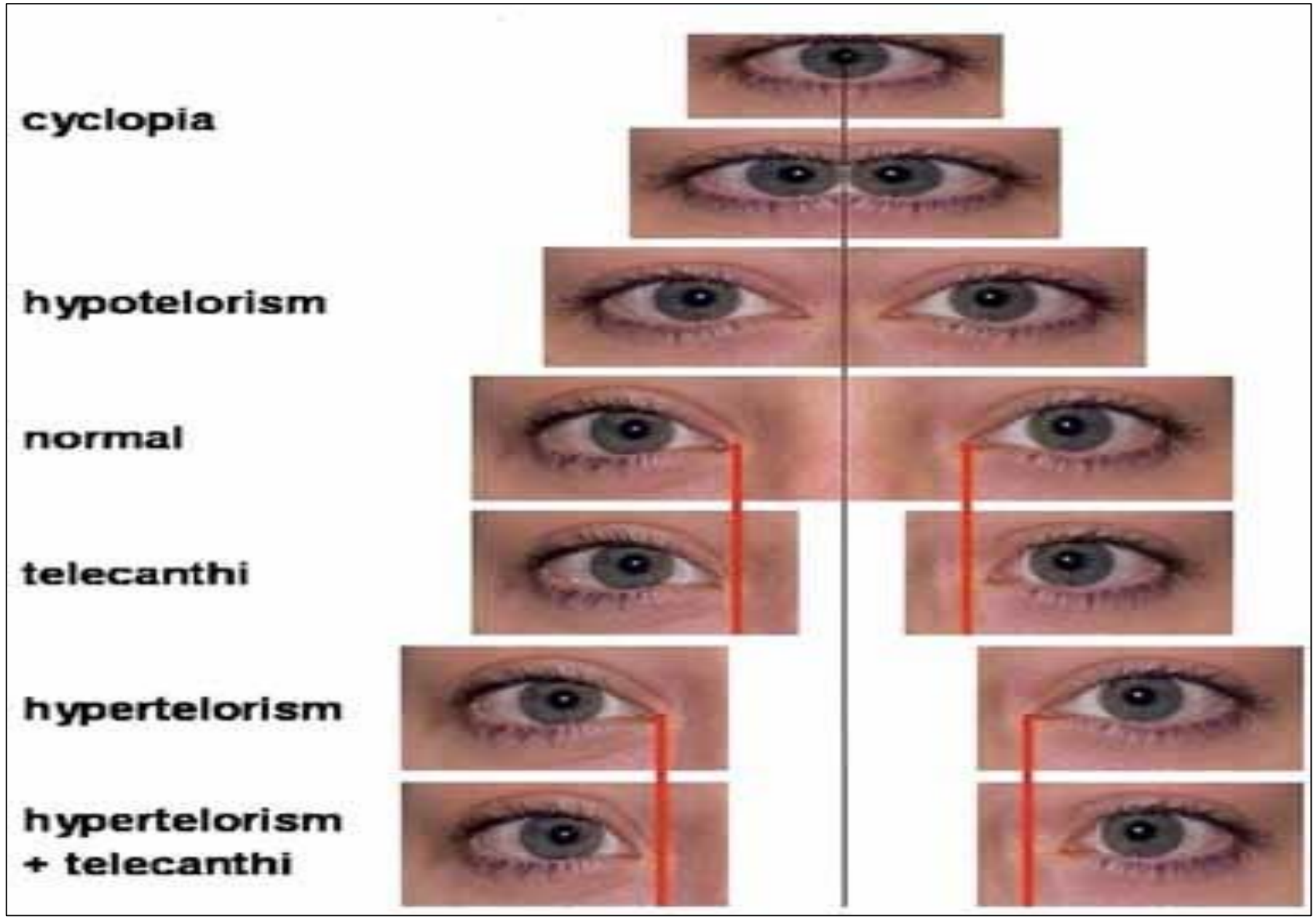
Esotropia

- Derived from 2 greek words- ‘eso’ which means ‘inward and ‘trepo’ means ‘turn’.

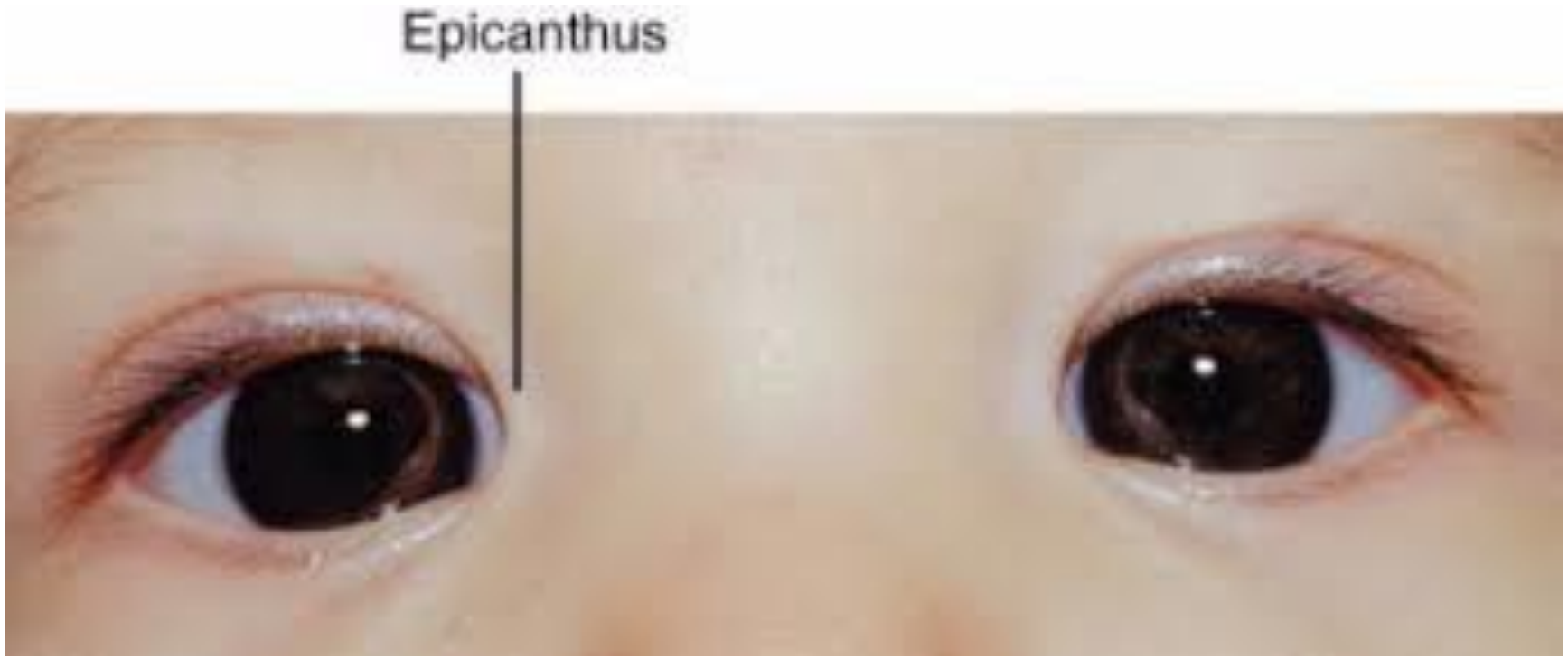
PSEUDOESOTROPIA

- Apparent convergent squint
- Angle kappa- negative
- Causes:
- 1. Telecanthus
- 2. Epicanthus

Telecanthus: elongation of medial canthal tendon

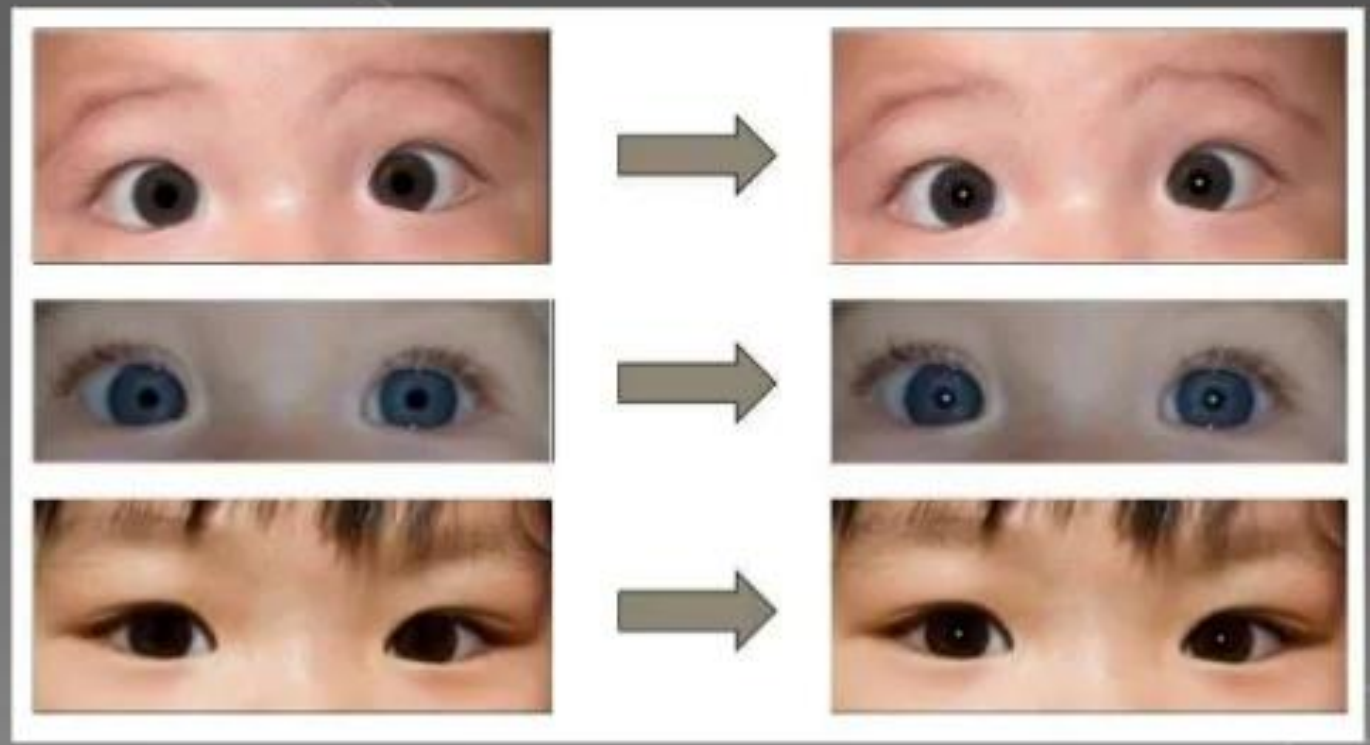

cyclopia
hypotelorism
normal
telecanthi
hypertelorism
hypertelorism
+ telecanthi

Epicanthus: skin folds




A
B

Symmetric corneal reflections
Epicanthus- no strabismus



Asymmetric corneal reflex- Hirschberg's test

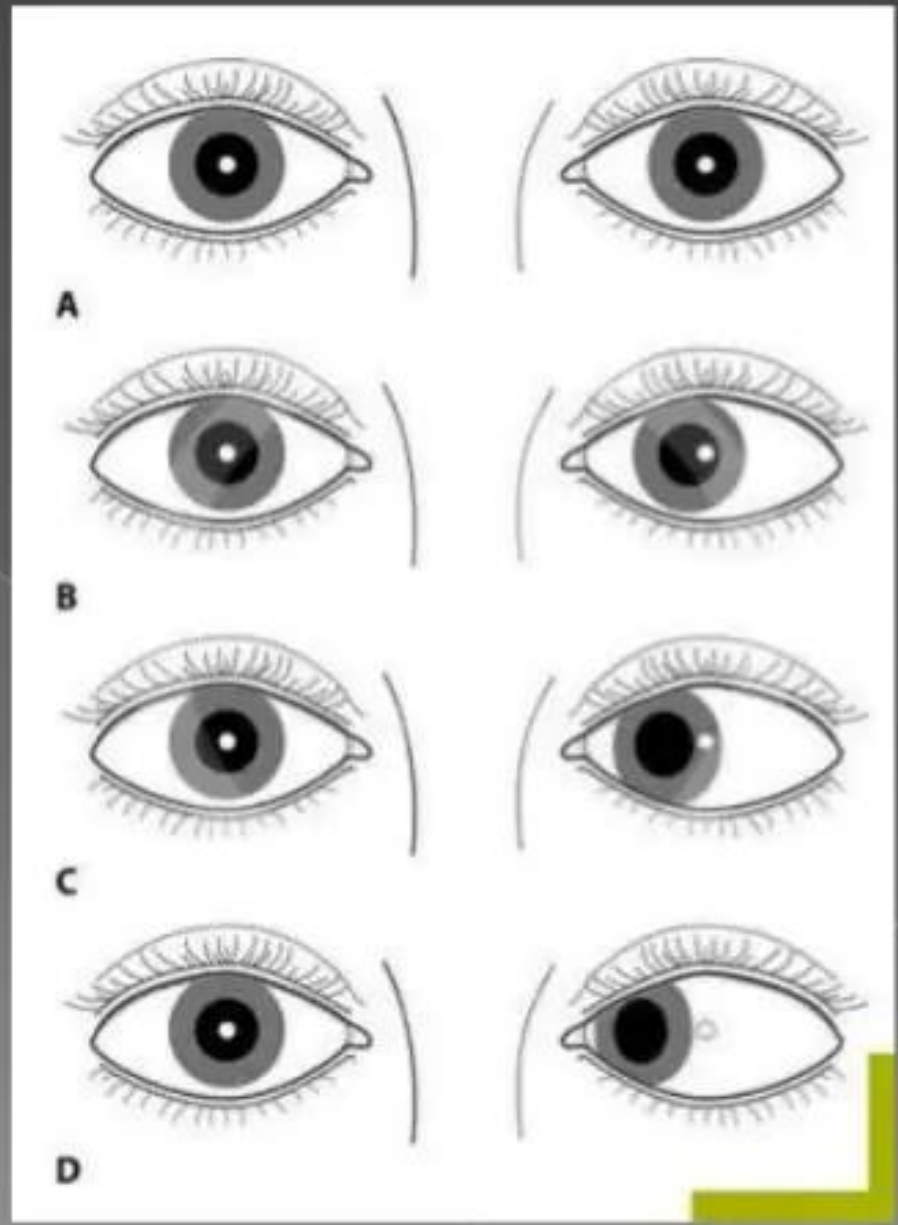
(A)-Symmetric central

Asymmetric –

(B) - Pupillary margin: 15°

(C) - Close to limbus: 30°

(D) -Beyond limbus: 45°



- Three commonly recognized stages:
- Esophoria
- Intermittent Esotropia
- Esotropia

ESOPHORIA

Eyes straight (maintained in position by fusion).

Position of eye under cover in esophoria (fusion-free position). Under cover, the right eye has deviated inward. Upon removal of cover, the right eye will immediately resume its straight-ahead position.

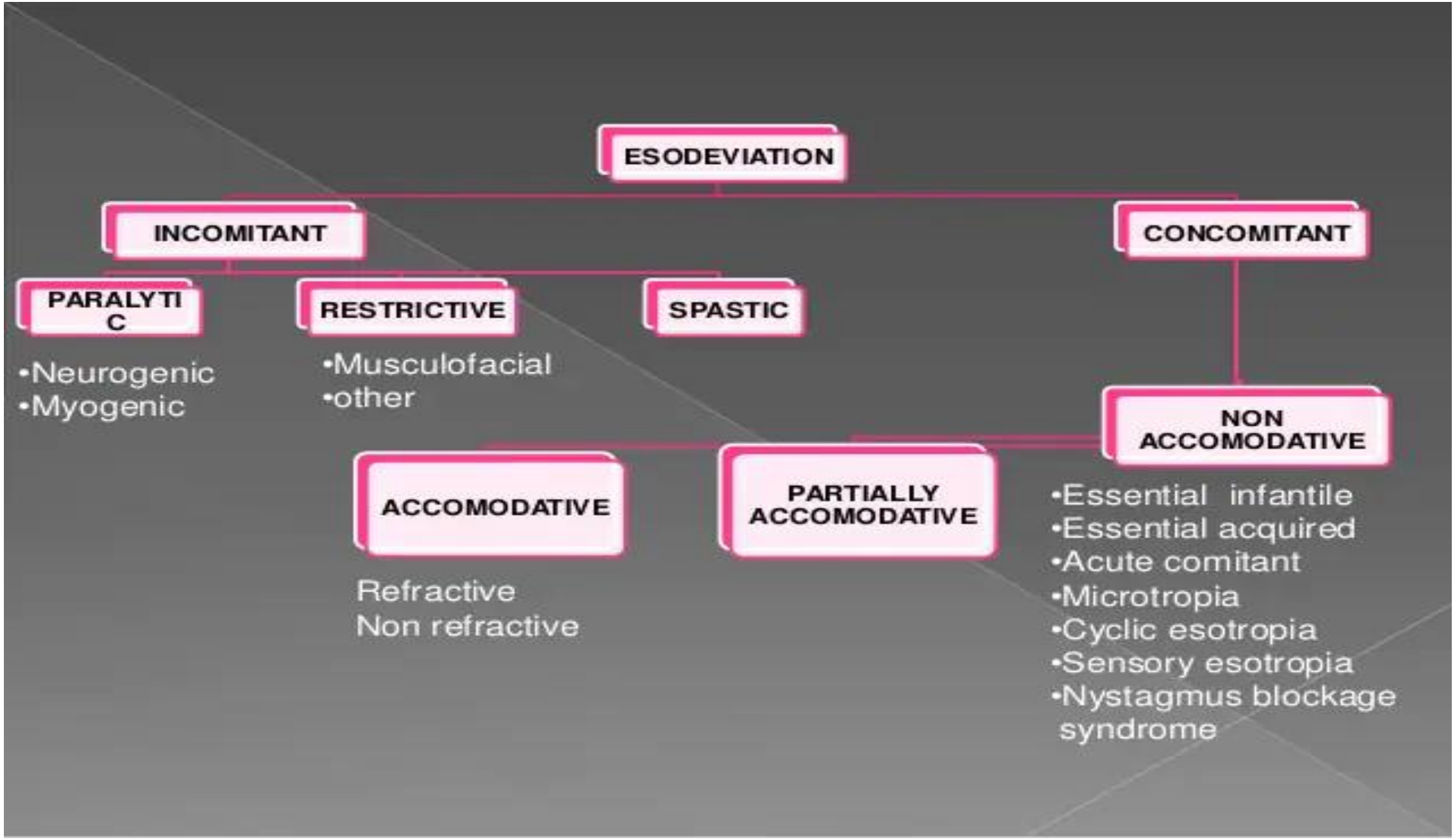
Source: Riordan-Eva P, Cunningham E: *Vaughan & Asbury's General Ophthalmology*, 18th Edition: http://www.accessmedicine.com

INTERMITTENT ESOTRORIA

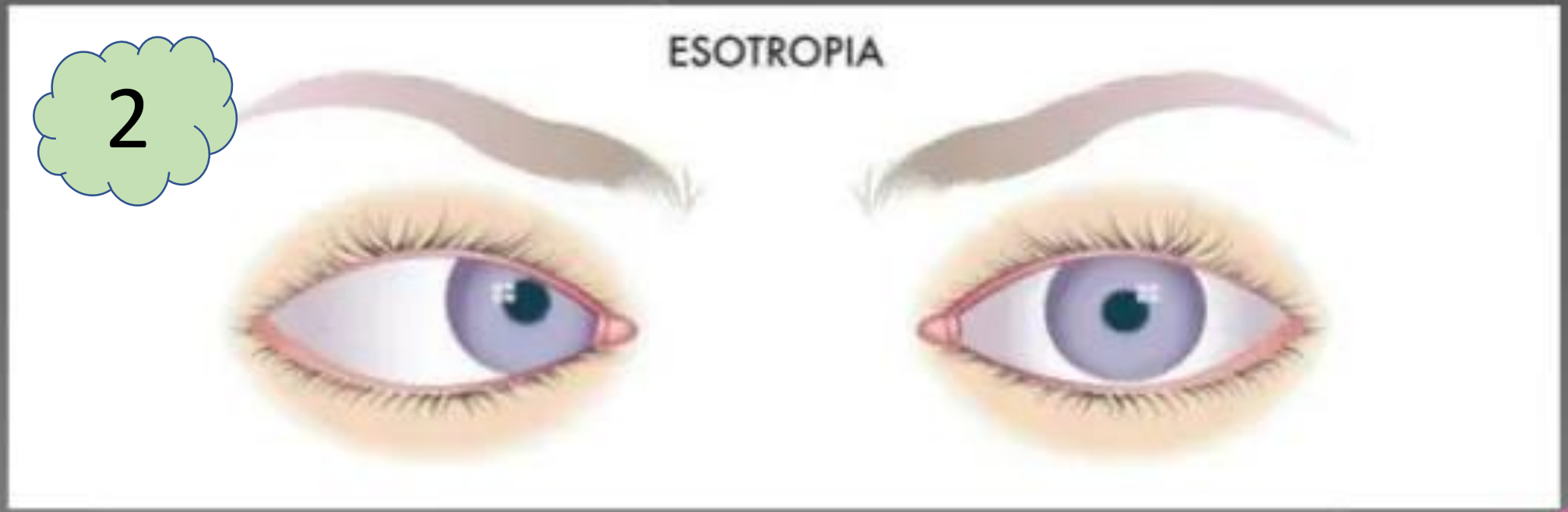
- Esodeviation that is intermittently controlled by fusion mechanisms.
- Manifest under certain conditions such as fatigue, illness and stress.

ESOTROPIA

- Esodeviation that is not controlled by fusional mechanisms so that deviation is constant


ESODEVIATION
INCOMITANT
CONCOMITANT
PARALYTIC
RESTRICTIVE
SPASTIC
•Neurogenic
•Myogenic
•Musculofacial
•other
NON ACCOMODATIVE
ACCOMODATIVE
PARTIALLY ACCOMODATIVE
Refractive
Non refractive
•Essential infantile
•Essential acquired
•Acute comitant
•Microtropia
•Cyclic esotropia
•Sensory esotropia
•Nystagmus blockage syndrome

2



CONCOMITANT ESOTROPIA

ACCOMODATIVE ESOTROPIA

- Esodeviations due to excessive convergence associated with accomodation are called accomodative esotropia.

CLINICAL PRESENTATION

- MOST CONSISTENT FEATURE:

VARIABLE ANGLE OF ESODEVIATION WHICH INCREASES WITH THE EFFORT FOR ACCOMODATION

REFRACTIVE NORMO-ACCOMODATIVE ESOTROPIA

- Uncorrected hyperopia
- To see clear at distance- they accommodate- esodeviation for distance fixation.
- Normal AC/A- therefore ET same for distance and near (within 15 PD)
- NO CONVERGENCE EXCESS
- Respond well to full cycloplegic correction of hyperopia

- Usually mild to moderate hyperopia (+2 to +6D)
- Very high hyperopia- donot accommodate- bilateral amblyopia
- Apart from ET and amblyopia, they may present with asthenopia due to constant accomodative effort.

Case - 4yr/male

Sudden onset right esotropia
Mother **would like to have the squint corrected**

Hirschberg: 15° esotropia OD

Cover/uncover test 30cm: moderate esotropia OD (dnmf)
Cover/uncover test 6m: small esotropia OD

Cardinal positions of gaze: full

Alternate prism and covertest 30cm: 36^ ET
Alternate prism and covertest 6m: 18^ ET

VOD **6/6** VOS **6/6**

Cycloplegic refraction:
OD S+3.50 // OS S+3.50

Would you operate or not?

Glasses: OD S+3.00
OS S+3.00

Hirschberg: **symmetric corneal reflections**

Stereopsis cc: 60 arcsec.

Cover/uncover test cc 30cm: small esophoria
Cover/uncover test cc 6m: orthophoria

Diagnosis:
Fully accommodative esotropia OD

AC/A RATIO

- Heterophoria method
- AC/A= IPD+ (Δn- Δd)/3
- Normal- 5-7.5pd/1D

- Gradient method
- AC/A= N-D/3
- Normal- 3-5pd/1D

REFRACTIVE HYPER-ACCOMODATIVE ESOTROPIA

- ET for distance + convergence excess (>15PD) ET for near (at 33cm)
- High AC/A ratio

NON REFRACTIVE ACCOMODATIVE ESOTROPIA

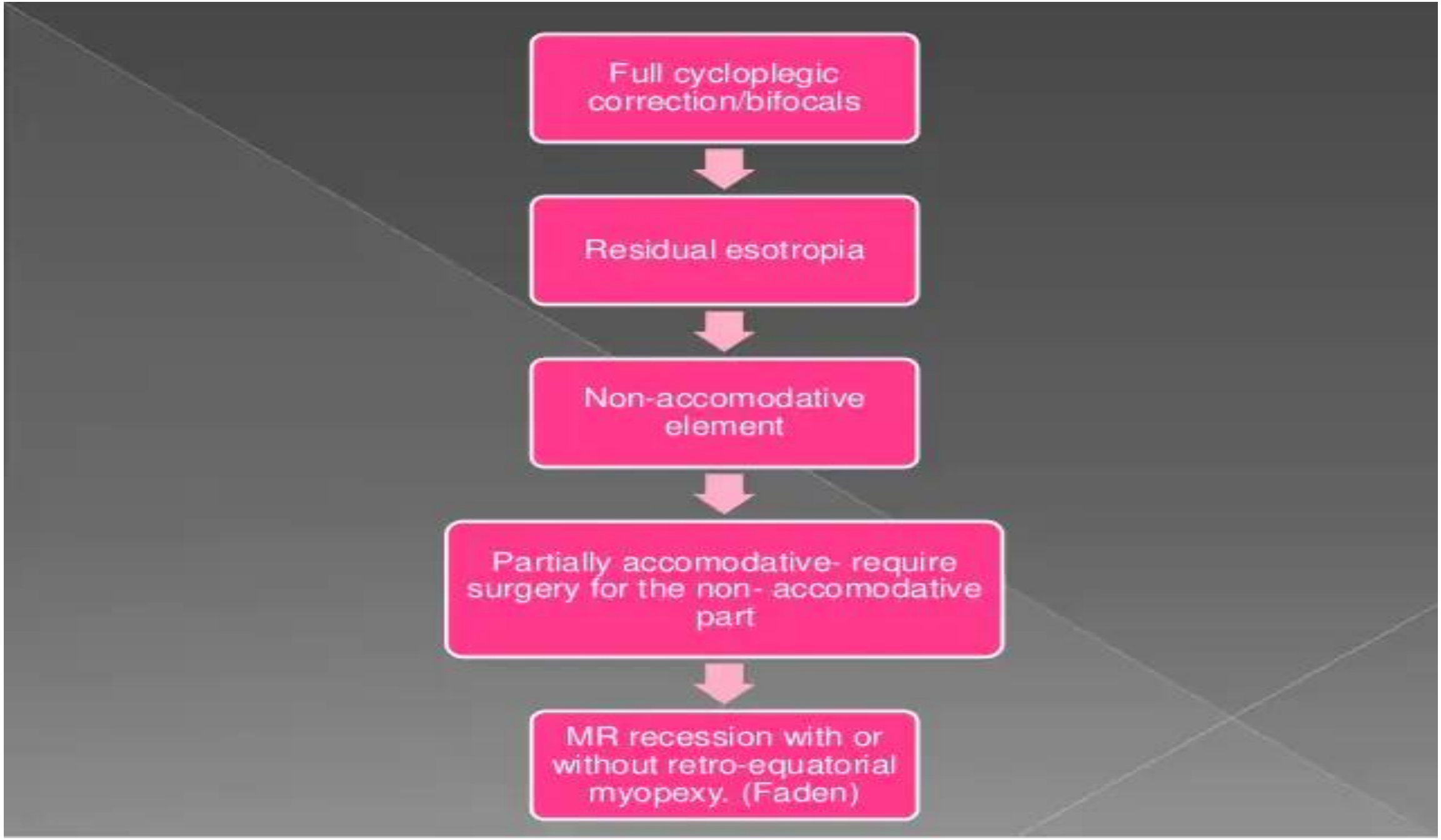
- No clinically significant hyperopia
- No accomodation for distance- no ET for distance
- High AC/A ratio
- >15PD ET for near
- ‘Hyper accomodative type’

AGE OF ONSET

- 2nd year of life
- Variable angle of ET, presence of convergence excess and full cycloplegic error should be looked for.

MANAGEMENT

- Full cycloplegic correction
- If convergence excess- bifocals are prescribed.
- The minimal plus add that corrects convergence excess ET is added.


Full cycloplegic correction/bifocals
Residual esotropia
Non-accomodative element
Partially accomodative- require surgery for the non- accomodative part
MR recession with or without retro-equatorial myopexy. (Faden)

Maddox Rod test

Part 4

TEST OBJECTIVE

- this test is performed to assess the type and size of a latent or manifest horizontal, vertical or torsional strabismus for distance and near fixation subjectively

Equipment required

- Maddox rod
- Source of spotlight
- Prism bar or loose prisms
- Trial frame

Set up

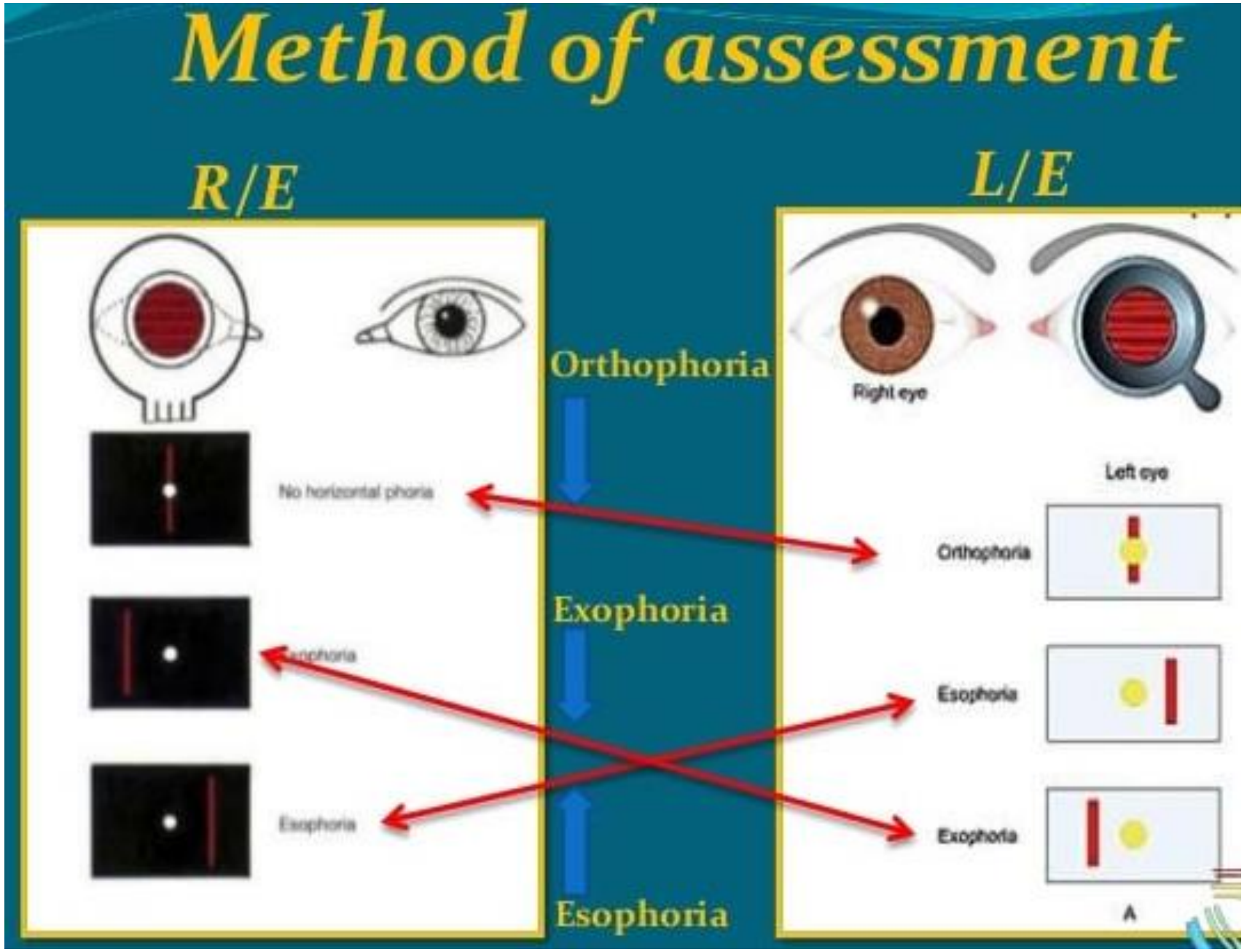
- patient should wear his/her optimal refractive correction
- patient should be explained about the test and the procedures of the test
- room light should be dimmed and make sure that other source of light does not disturb the patient's view of the streak and target spotlight

DISTANCE AND NEAR CYCLODEVIATION

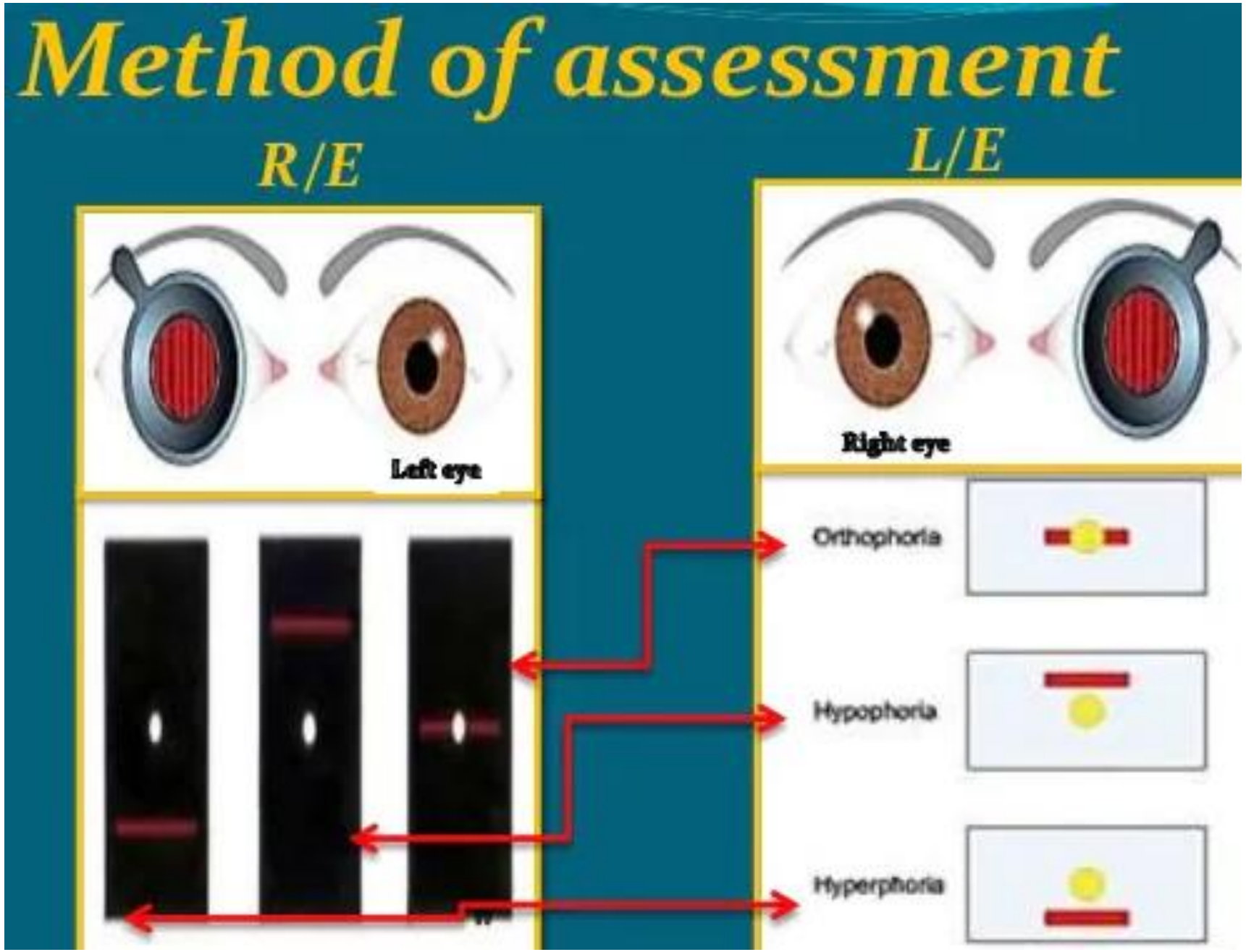
2. Double Maddox Rod Test

- subjective test which uses two maddox rods, one before each eye
- used to determine cyclodeviation or torsion
- the test can be done in all the position of gazes for comparison
- traditionally, a red Maddox rod was placed before the right eye and a white Maddox rod before the left, but evidence suggests the different colors can cause fixation artifacts that do not occur if the same color is used bilaterally
- therefore, nowadays red maddox rods are preferred before both the eyes during the test

Maddox rod

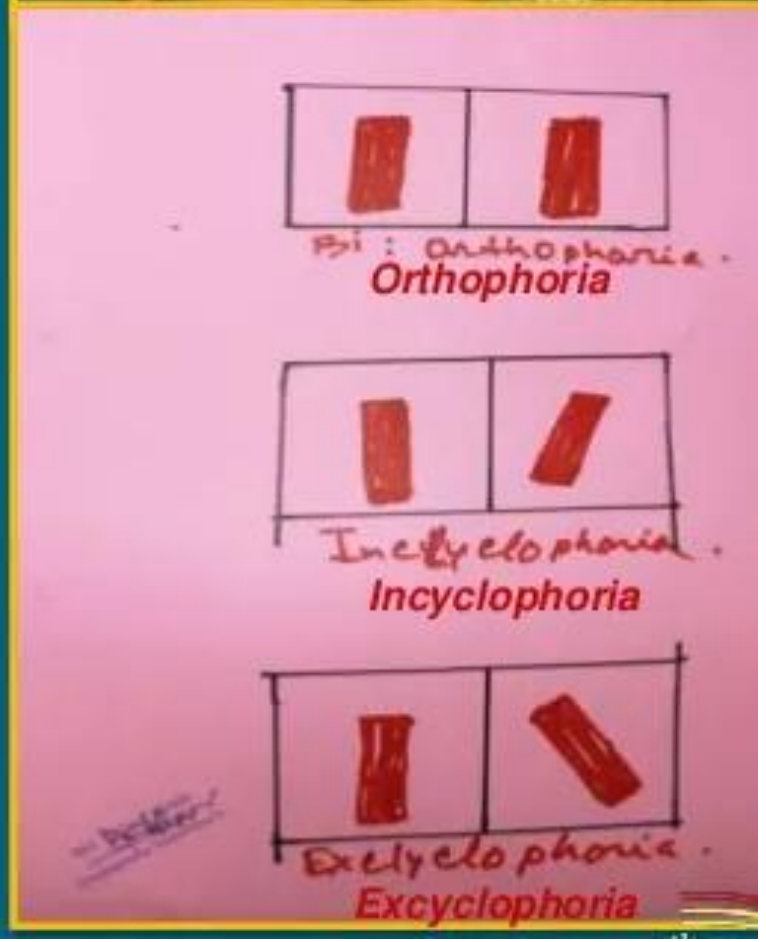

Method of assessment
R/E
L/E
Orthophoria
Exophoria
Esophoria
No horizontal phoria
Esophoria
Right eye
Left eye
Orthophoria
Esophoria
Exophoria
A

Method of assessment



Method of assessment Double MR Test

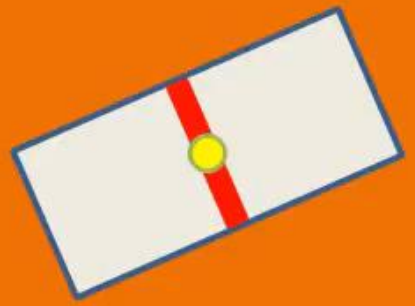
- Can be determined by the angle of rotation that causes the line images to appear horizontal and parallel.
- The amount of cyclodeviation is measured in degrees, utilised from the scale on the trial frame.



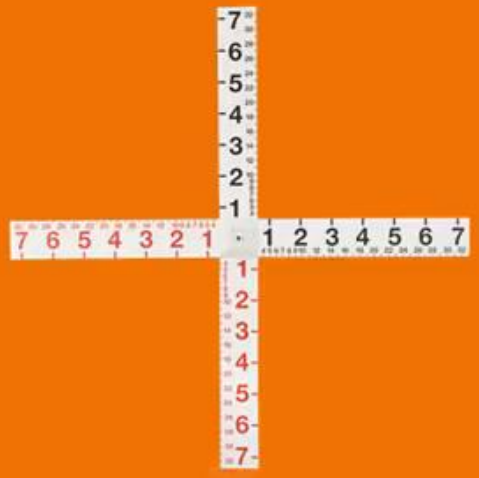
Take Home Messages

- MR Used only for detect Phoria
- Thickest part is the Base of prism
- Exo: =BI prism & Eso: = BO prism
- Hyper: = BD prism & Hypo: = BU prism

Orthophoria



Maddox Rod Test

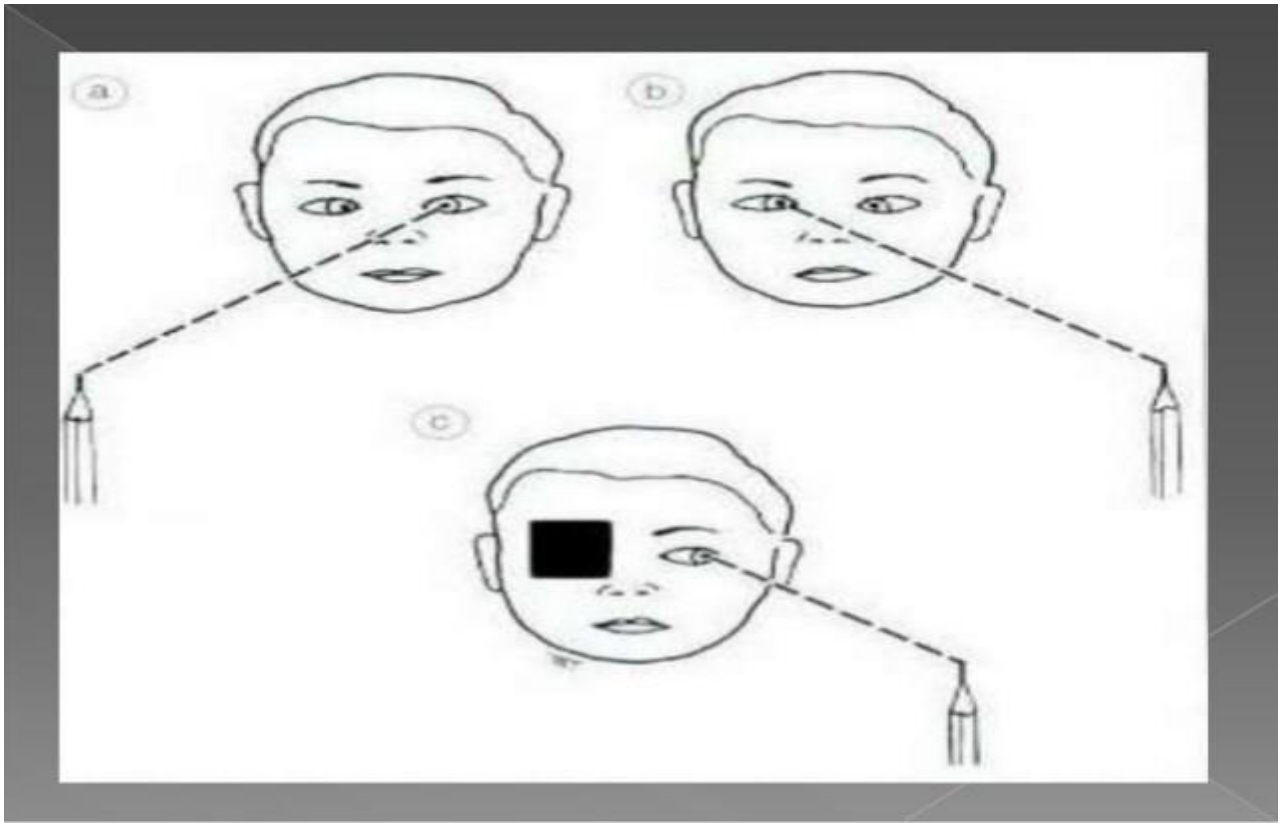


Presented By: Aklesh Kumar
(Optometrist)

Esotropia
Part II

Clinical Features

- Within first 6 months of life
- Large angle esotropia
- Alternate fixation:
  - Target to right, fixates with the left eye
  - Target to the left, fixates with the right eye
- Apparent limitation of abduction


a
b
c

Clinical Features

- Associated with vertical divergence & inferior oblique over-action over the period of time
- Mild to moderate amblyopia
- Small degree of hyperopia

7.May be associated with:

- IOOA (68%)
- Nystagmus (33%)
- DVD(50%)

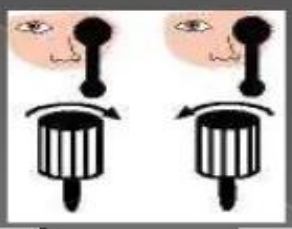
8. Asymmetric optokinetic nystagmus:

Temporal to nasal- smooth

Nasal to temporal- cogwheel

A special characteristic of congenital esotropia - OKN asymmetry

Temporal to nasal (T/N)
Smooth, following and rapid refixation



Nasal to temporal (N/T)
Jerky inaccurate movements
with halting refixation

OKN asymmetry is present in all infants but becomes symmetrical by 6 months.
Patients with congenital ET retain OKN asymmetry

DIFFERENTIAL DIAGNOSIS	
Cranial nerve 6th palsy	Doll's eye manouvere
Duane's retraction syndrome	Changes in palpebral aperture, upshoot/downshoots on adduction
CNS anomalies	Down's syndrome, Mobius, Cerebral Palsy, Albinism
Accomodative ET/ Partially accomodative ET	Cycloplegic refraction
Nystagmus blockage syndrome	Inverse relation between amplitude of nystagmus and degree of esotropia

Management

- Depends on treatment of amblyopia
- Full cycloplegic refraction under atropine 1 % eye ointment
- Full hyperopic correction
- Occlusion

Occlusion therapy

- Conventional full time, fully opaque occlusion of dominant eye.
- At no point during the treatment, is binocular viewing allowed.
- Thus, patching is done for 3:1, 4:1 or 5:1 days for a 3,4 or a 5 year old child respectively.
- Above 6 years, the regime remains 6:1 for all ages.

- Vision assessment done monthly. (fortnightly in infants).
- End point: free alternation of the two eyes which is equally maintained.

Surgery

- Large angle ET- earliest/ 4 months of age
- Small angle ET- proper hyperopic correction till 6 months or till examination can be done satisfactorily.

Factors to be considered

- Associated inferior oblique ‘v’ phenomenon
- Amblyopia therapy
- DVD
- Nystagmus
- Eccentric fixation or uncorrected amblyopia have unpredictable results.

Surgical guidelines

- MR surgery is more effective LR surgery
- Mono-ocular recession-resection or bimedial recession
- MR 1mm surgery corrects 3-4.5 PD of deviation
- LR 1mm surgery corrects 2-3 PD of deviation

CYCLIC ESOTROPIA

- Regular cycles of presentation
- Usually 24-48 hours of squint alternating with same duration of no squint.
- Squint days:
- 1. large angle ET (40-50PD)
- 2. sensory anomalies
- 3. squint is consistent.

- No squint days:
- 1. BSV with good fusional amplitudes
- 2. No latent squints

Lasts for a few months to years before they become fully manifest squints

Surgery as per deviation on squinting days gives satisfactory results.

NYSTAGMUS BLOCKAGE SYNDROME

- Infantile ET is associated with manifest-latent and latent nystagmus.
- However, there is a special form of nystagmus which has a dampening mechanism with eyes in adduction
- Inverse relationship between ET and nystagmus
- Nystagmus is present when eyes are straight and it disappears when eyes are locked in ET.
- Management: Faden with or without B/L MR recession.

SENSORY ESOTROPIA

- Lost vision in one eye usually develops squint over a period of time.
- XT or ET depending on convergence tonus
- XT- in first year and after 8-9 years of age
- ET- after first year upto 8-9 years of age
- Refractive error and accomodative status of the straight eye needs to be evaluated before planning any cosmetic surgery