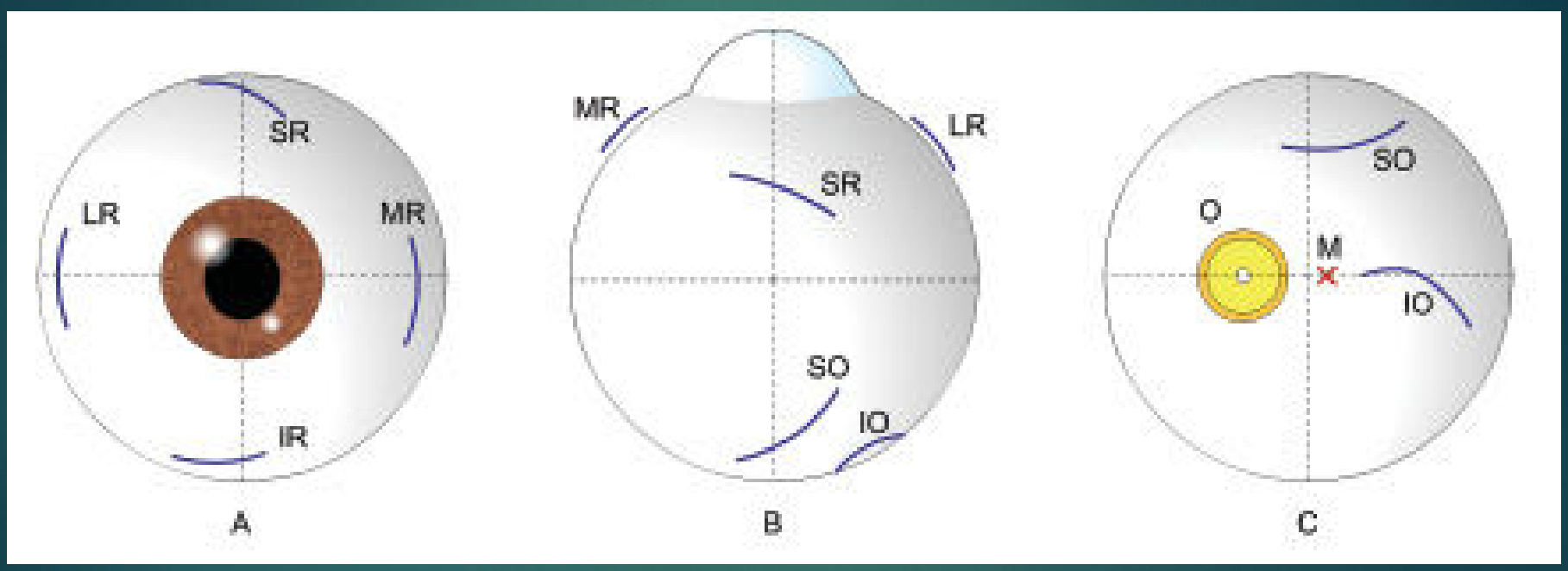
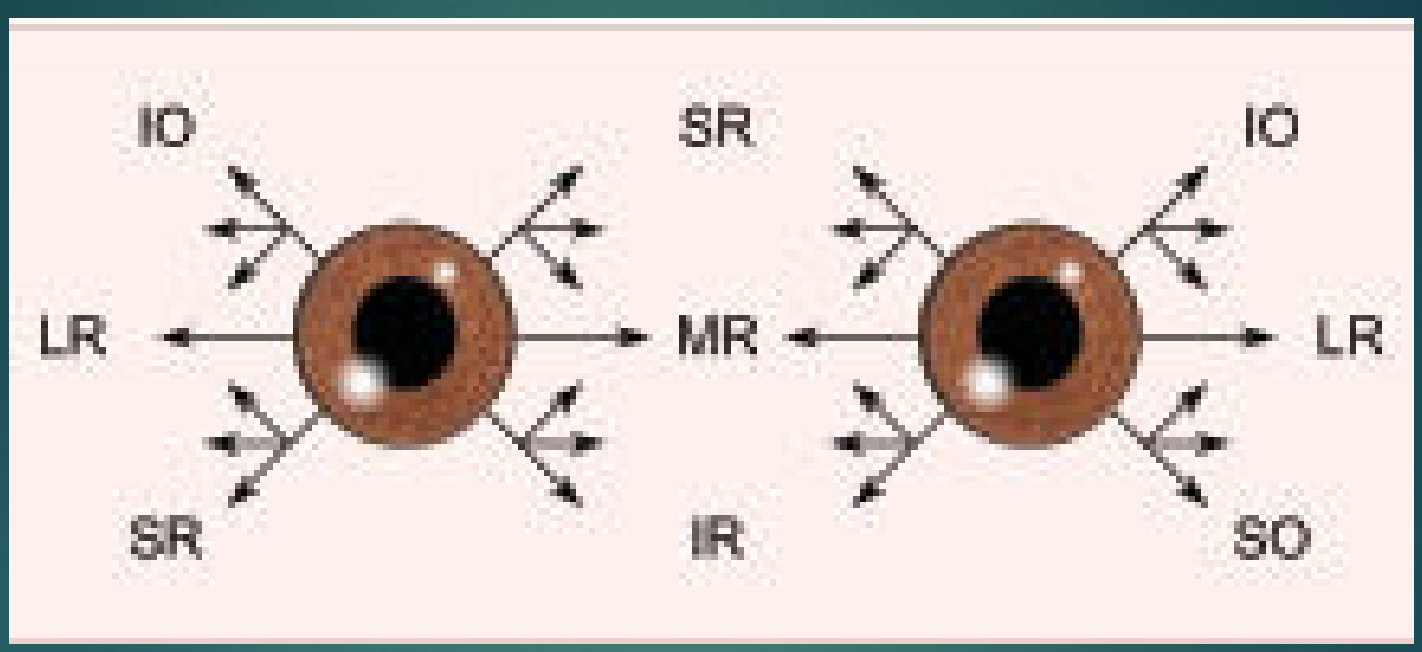
Binocular Single Vision and Amblyopia

Extra ocular muscles

- Names
- Nerve supply and insertion
- Action





- **OCULAR MOTILITY**
- **A *Uniocular movements are called 'ductions' and***
- 1. *Adduction.*
- 2. *Abduction*
- 3. *Supraduction.*
- 4. *Infraduction.*
- 5. *Incycloduction*
- 6. *Excycloduction*

- **B *Binocular movements.***
- **versions and vergences.**

- Versions (conjugate movements)

1.Dextroversion

2.Levoversion

3.Supraversion

4.Infraversion

5.Dextrocycloversion

6.Levocycloversion

- *Vergences (dysconjugate movement)*
- 1. Convergence
- 2. Divergence

- 1.*Synergists.*
- 2.*Antagonists.*
- 3.*Yoke muscles.*
- 4.*Contralateral antagonists.*

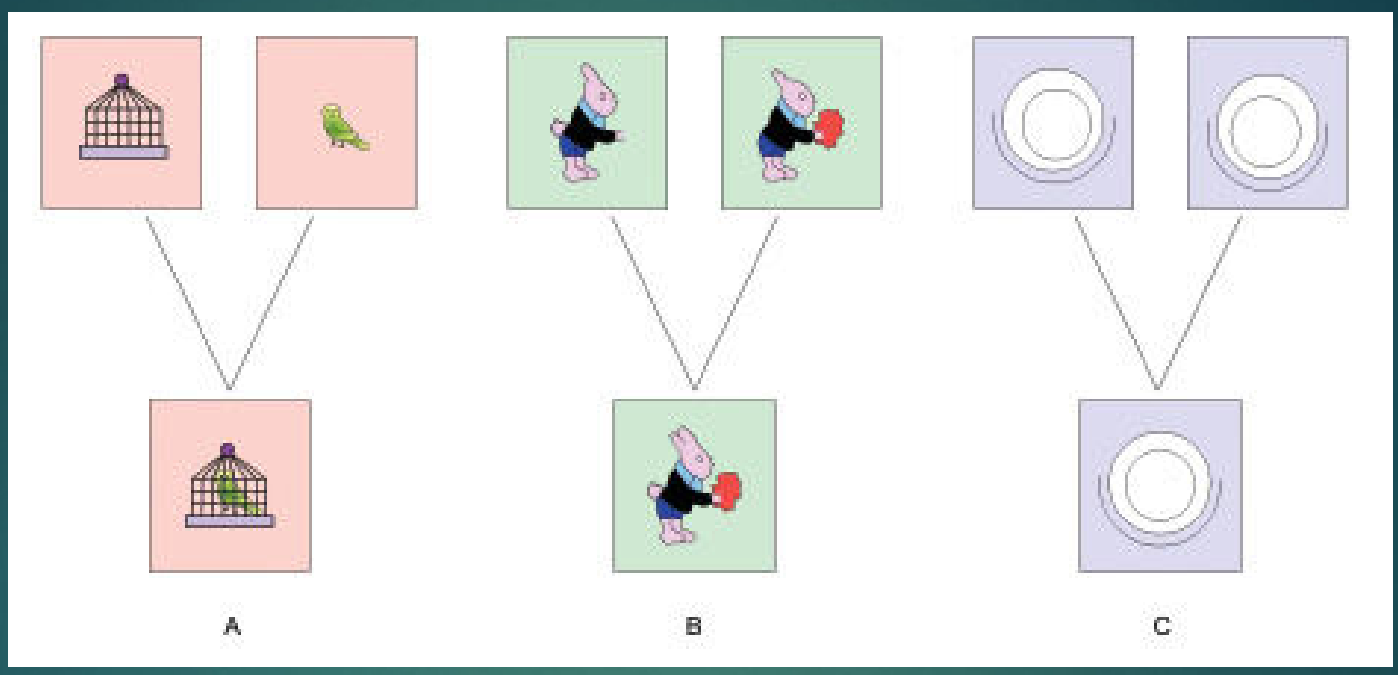
Binocular single Vision

- When a normal individual fixes on an object of regard, the image is formed on the fovea of both the eyes separately; but the individual perceives a single image.

- This state is called *binocular single vision*.

- **Grades of binocular single vision**
- ***Grade I — Simultaneous perception.***
- ***Grade II—Fusion.***
- ***Grade III— Stereopsis.***

- ***Grade I — Simultaneous perception.*** Ability to see two dissimilar objects simultaneously.
- ***Grade II—Fusion.*** It consists of the power to superimpose two incomplete but similar images to form one complete image.
- ***Grade III— Stereopsis :*** Depth perception.



Prerequisites of development of BSV

- Straight eyes (motor mechanism)
- Clear vision in both eyes (Sensory mechanism)
- Ability of visual cortex to promote BSV (Central mechanism)

- **Advantage of BSV**
- Enlargement of field of vision
- Depth perception
- Combined binocular visual acuity is better than uniocular VA.

- **Anomalies of binocular vision**
- **Suppression**
- **Amblyopia**

- **Suppression**
- It is a temporary active cortical inhibition of the image of an object formed on the retina of the squinting eye.

AMBLYOPIA: DEFINITION

- Amblyopia refers to partial loss of vision in one or both eyes, in the absence of any detectable organic cause.

AMBLYOPIA: SIGNIFICANCE

- 2%–4% of population affected
- Commonly unilateral
- Bilateral amblyopia (rare) may mean permanently decreased visual acuity

- *Amblyogenic factors include :*
- Visual (form sense) deprivation as occurs in anisometropia,
- Light deprivation e.g., due to congenital cataract,
- Abnormal binocular interaction e.g., in strabismus.

SCREENING: IMPORTANCE

- Amblyopia is usually preventable or treatable
- Early detection is key to effective treatment
- Life-threatening disorders may present as amblyopia
- Screening responsibility rests with primary care physician

- Types of Amblyopia

1. Strabismic
2. Anisometropic
3. Stimulus deprivation
4. Isoametropic
5. Meridional
6. Idiopathic
7. Organic

- Diagnosis

1. Reduced VA
2. *Effect of neutral density filter.*
3. *Crowding phenomenon*
4. *Fixation pattern*
5. *Colour vision unaffected*

- Treatment

Treatment of underlying cause followed by:

1. Occlusion therapy
2. Atropine Penalization
3. Drugs like levodopa.

EARLY DETECTION: IMPORTANCE

- Visual function develops early in life
- Treatment depends on plasticity of visual system
- Treatment less likely to be effective as children age increases

PREVENTING AMBLYOPIA: CONSIDERATIONS

- Predisposing factors
- Presenting features
- Detection methods
- Treatment rationale

AMBLYOPIA: PREDISPOSING FACTORS

- Poor clarity (media opacities) or blockage of light pathway (ptosis)
- Poor focus (refractive error)
- Poor aim (strabismus)

UNILATERAL AMBLYOPIA: PRESENTATION

- Failed vision test
- Strabismus
- Parental concern
- Family history of amblyopia or strabismus

VISION SCREENING AGES 3-5

May peek around ocluder

Adhesive patch works best

Strabismus is common underlying cause of amblyopia.

DIPLOPIA IN CHILDREN

- Not a feature of strabismus
- May indicate a serious condition
- Evaluate promptly and refer

Preventing Amblyopia

AMBLYOPIA: EARLY DETECTION

- Assess red reflex
- Determine visual acuity
- Evaluate ocular alignment

Normal red reflex

Preventing Amblyopia

Asymmetric red reflex

Direct ophthalmoscope

Preventing Amblyopia

NORMAL INFANT VISION

- Good visual function
- Fixate and follow with each eye
- Steady fixation

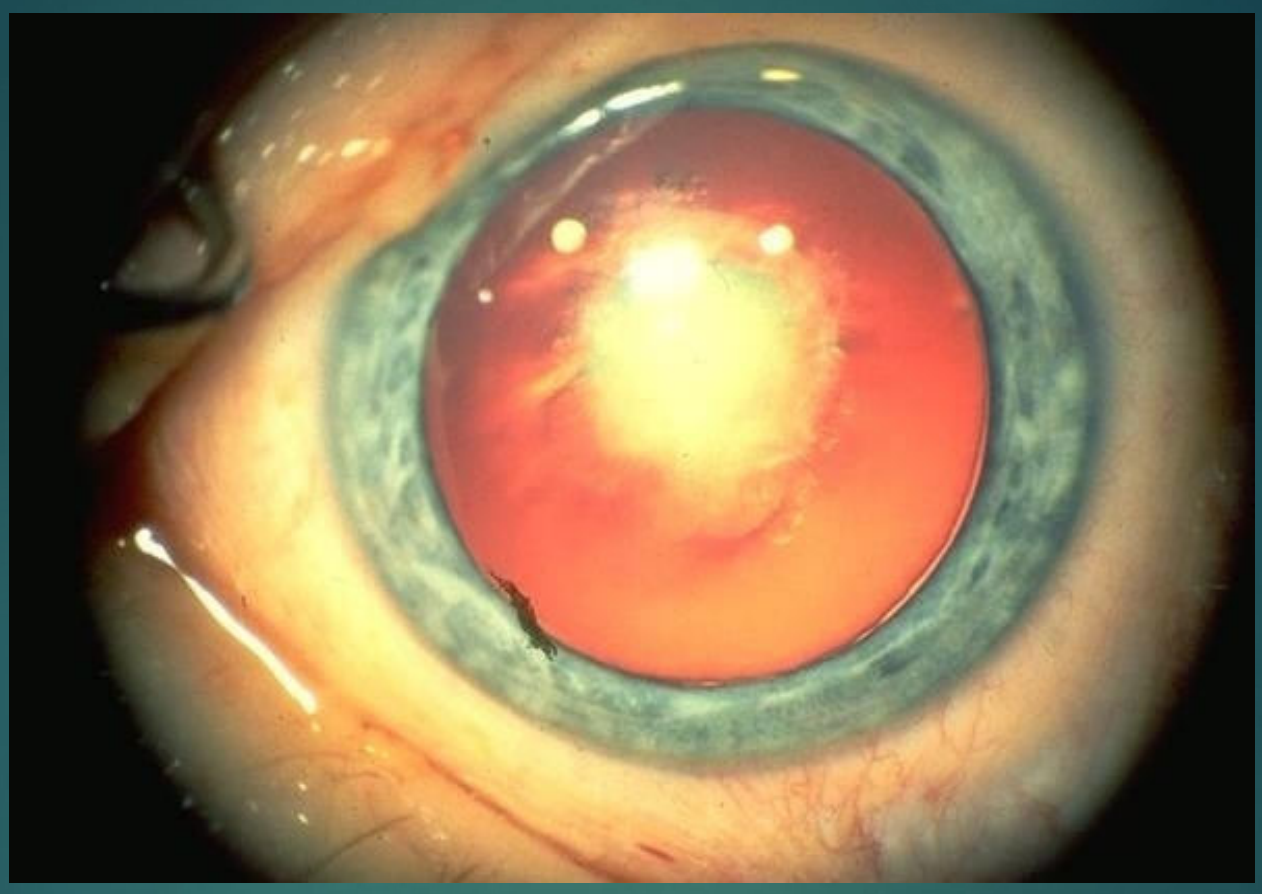
REFERRAL: IMMEDIATE

- Poor red reflex in one or both eyes
- Concern about visual function by parent or doctor
- Asymmetric or diminishing visual acuity
- Constant or acute-onset strabismus

Preventing Amblyopia

AMBLYOPIA: TREATMENT RATIONALE

- Clearing the media
- Focusthe image
- Initiating amblyopia therapy



Congenital cataracts

Preventing Amblyopia

OCCLUSION THERAPY: PURPOSE

- Improves visual acuity
- Does not eliminate strabismus

OCCLUSION THERAPY: PRECAUTIONS 1

- Monitor visual acuity carefully at close intervals
- Ensure vision is not being reduced in non-patched eye ("occlusion amblyopia")

Preventing Amblyopia

OCCLUSION THERAPY: PRECAUTIONS 2

- Part-time occlusion may suffice
- Ensure parents understand purpose of patching and importance of compliance
- Follow child's visual status into the teen years

ATROPINE PENALIZATION THERAPY

- Atropine ointment or drops in non-amblyopic eye at prescribed levels
- Atropinized eye cannot accommodate for near vision
- Child can still use better-seeing eye for distance
- Child switches fixation at near to amblyopic eye

Preventing Amblyopia

ATROPINE THERAPY: PRECAUTIONS

- Monitor VA carefully.
- Ensure near VA in amblyopic eye can support near tasks
- Allergic reactions are rare (<1%)
- Systemic side effects are uncommon and minimal

Warn parents that one eye will have a "fixed and dilated pupil."

MCQs

1. The primary action of superior oblique muscle is:

a. Incyclotorsion
b. Adduction
c. Depression
d. Elevation

MCQs

2. The secondary action of medial rectus muscle is:

a. Incyclotorsion
b. Adduction
c. Depression
d. None

MCQs

3. The secondary action of superior rectus muscle is:

   a. Incyclotorsion
   b. Adduction
   c. Depression
   d. None

MCQs

4. The extra ocular muscle inserted closest to the limbus:

   a. IR
   b. MR
   c. SR
   d. LR

MCQs

6. The extraocular muscle which does not arise from annulus of zinn:

a. IR
b. MR
c. SR
d. IO

MCQ

7. Amblyopia results from:

a. Abnormal binocular interaction
b. Defective spacial visual processing occurring in central visual pathways
c. Stimulus deprivation
d. All

MCQs

8. What is amblyopia?

a. Unilateral or bilateral subnormal vision without any organic cause
b. Bilateral subnormal vision with organic cause
c. Bilateral subnormal vision due to macular pathology
d. Unilateral subnormal vision with organic cause

MCQs

9. A 4 yr old boy presented with inward deviation of either for 6 months. On dilated retinoscopy the patient had refractive error of +4 DS. What would be the first line of management?

a. Refractive correction
b. Squint surgery
c. Occlusion therapy
d. Orthoptic exercise

MCQ

10. The best treatment modality for amblyopia is:

a. Refractive correction only
b. Refractive correction followed by occlusion therapy
c. Orthoptic exercise
d. Ocular surgery