



# Eye movement problems in adults

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- Horizontal misalignment
- (Cyclo)vertical misalignment
- Special forms of strabismus
- Pathological nystagmus and other ocular oscillations

**OVERVIEW**

**HORIZONTAL MISALIGNMENT**



# HORIZONTAL MISALIGNMENT

- **Comitant**
  - 1. Esotropia
  - 2. Exotropia
  
- **Non-comitant**
  - 1. Cranial nerve problem: causes/location
  - 2. Neuromuscular junction
  - 3. Extraocular muscle disease
  - 4. Orbital disease

## **Horizontal misalignment**

- **Comitant**

<b>Esotropia</b>	<b>Exotropia</b>
Infantile	Infantile
Fully/partially accommodative	Intermittent distance exotropia
Sensory	Sensory
Sudden onset	Sudden onset
Residual	Residual
Consecutive	Consecutive

## **Horizontal misalignment**

## Longstanding? Routine referral



**What can we do?**  
**Assess, advise, operate**

## **Non-comitant**

1. Cranial nerve problem
2. Neuromuscular junction
3. Extraocular muscle disease
4. Orbital disease

## **Horizontal misalignment**



## Cranial nerve anomaly/disease: causes

Palsy/paresis

Congenital/developmental

Tumour

Vascular

Inflammatory

Trauma

Immune

Other

# 1. CN problem: Causes



## Causes of sixth nerve palsy

**Most common: vascular (diabetes, hypertension, atherosclerosis)**

Trauma

Watch out for:

**Raised intracranial pressure**

Giant cell arteritis

Cavernous sinus mass

Brain stem tumour, aneurysm

Multiple sclerosis, sarcoidosis, vasculitis

**Urgent referral**



**Sixth nerve palsy**

## Investigations for sixth nerve palsy

Check blood pressure, blood sugar

Check full blood count, inflammatory markers, renal function, cholesterol

Fundoscopy, Ishihara, neuro exam

Decide whether imaging is needed, and how urgently

Involve other hospital specialists if underlying condition such as MS identified

## Urgent referral



## What will we do?

## Management of sixth nerve palsy

Treatment for any underlying condition

Ophthalmic:

prisms

occlusion

After 6-12 months of stable measurements: surgery

Botulinum toxin

## Urgent referral



## What will we do?

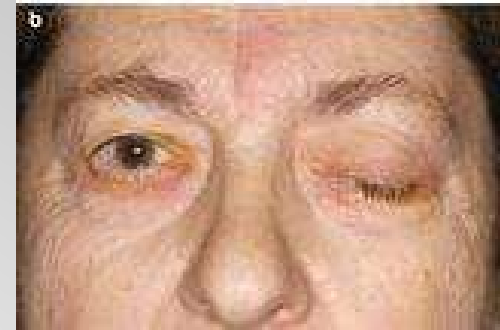
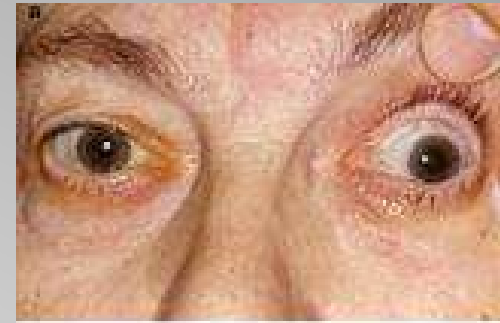
## Horizontal gaze palsy

Limitation of abduction on one side  
(abducens nerve)

Limitation of adduction of the other eye  
(contralateral oculomotor nerve)

Cause: lesion affecting interneurons  
from abducens nucleus to oculomotor  
nucleus in the pons

**Sixth plus: horizontal gaze palsy**

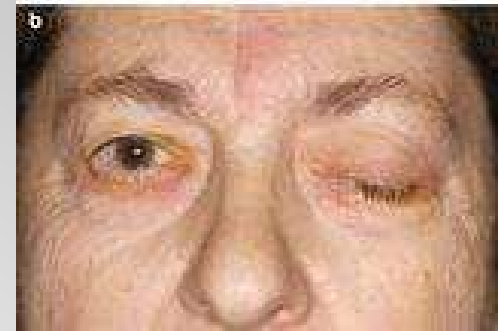
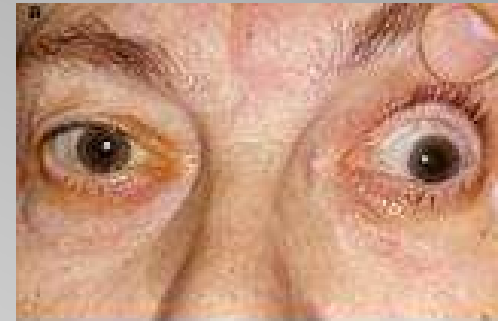


**New case**

Down and out

Ptosis

Dilated pupil (or not)



**New case**



## Causes of third nerve palsy

ANEURYSM (rare, posterior communicating artery)

Most common: vascular (diabetes, hypertension, atherosclerosis)

Trauma

Watch out for:

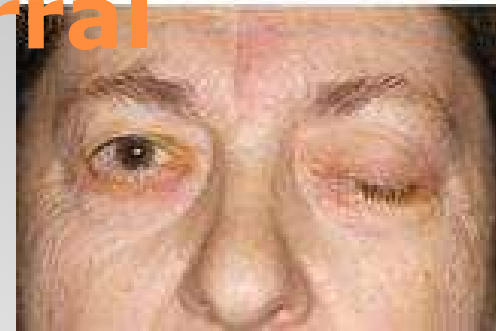
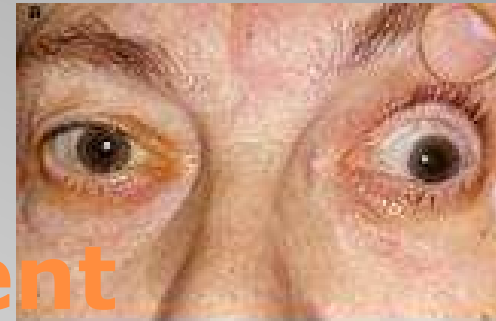
Giant cell arteritis

Cavernous sinus mass

Tumour

Multiple sclerosis, sarcoidosis, vasculitis

Urgent referral



# Third nerve palsy

## Investigations for third nerve palsy

Check blood pressure, blood sugar

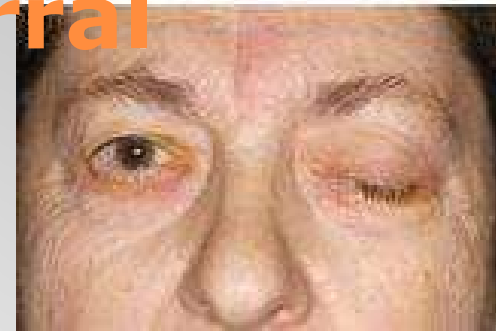
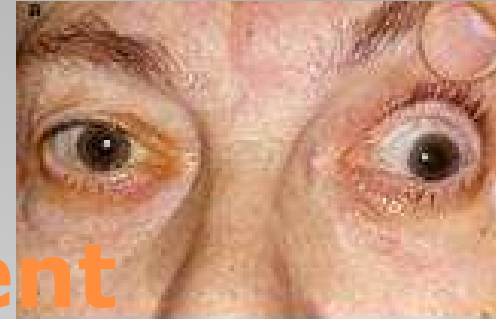
Check full blood count, inflammatory markers, renal function, cholesterol

Fundoscopy, Ishihara, neuro exam

Decide whether imaging is needed, and how urgently

Involve other hospital specialists if underlying condition identified

**Urgent referral**



## What will we do?

## Management for third nerve palsy

Treatment for any underlying condition

Ophthalmic:

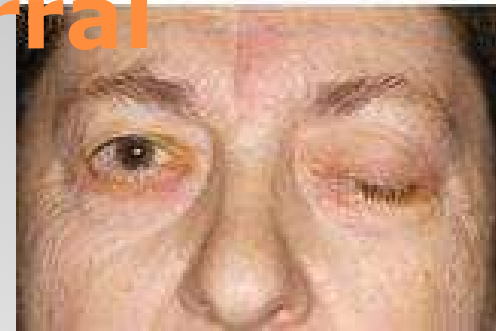
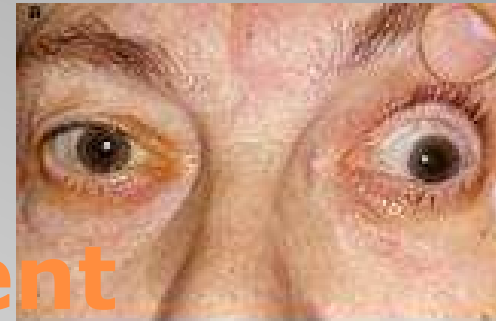
prisms

Occlusion if diplopia (usually ptosis)

After 6-12 months of stable measurements: surgery

Botulinum toxin

**Urgent referral**



# What will we do?

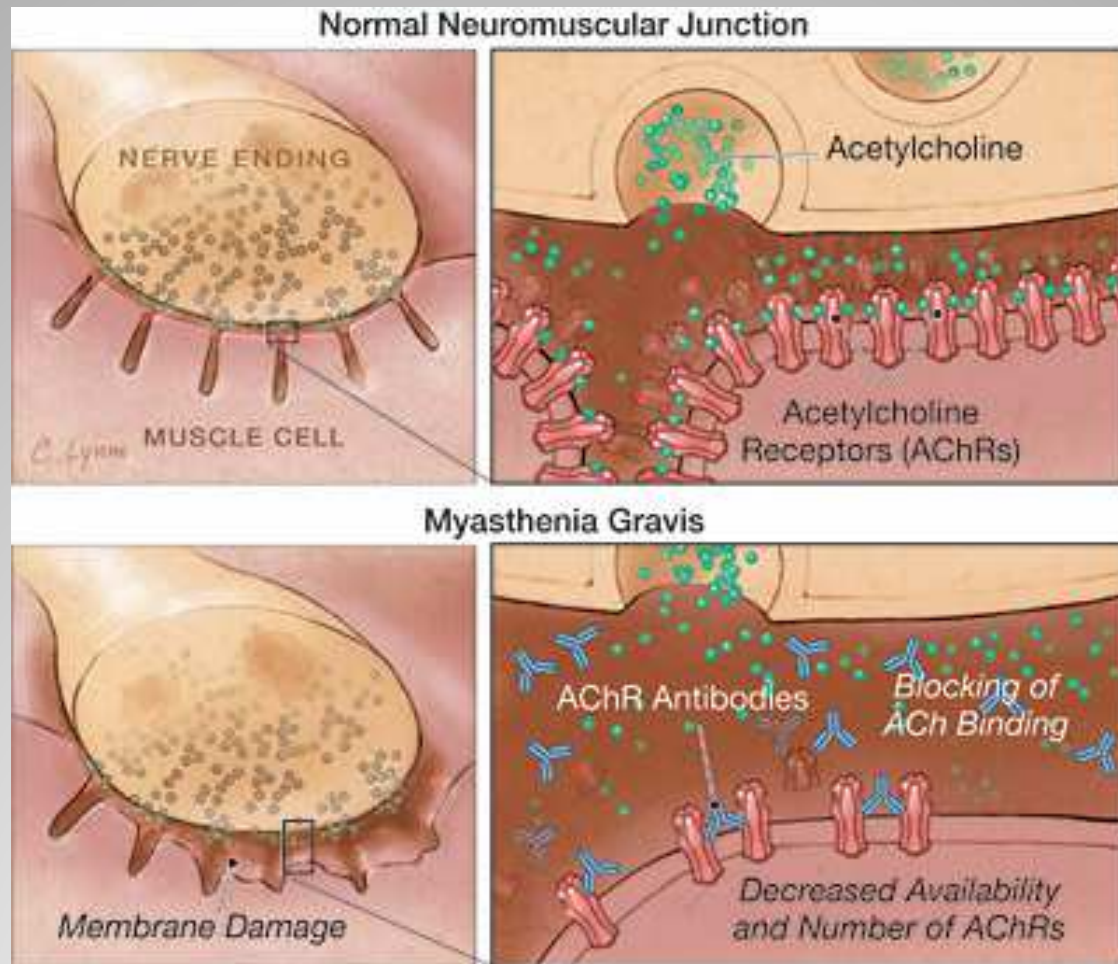




Myasthenia – Fatigue and Recovery Test 'Simpson plus'



**New case**



## 2. Neuromuscular Junction

## Neuromuscular junction: Myasthenia

Varying symptoms and signs

Fatiguability

Generalised symptoms of weakness, breathing problems, chewing/swallowing difficulties, change of voice

**Tests:** anti-acetylcholine receptor antibodies (negative in up to 50% of ocular only myasthenia), MuSK (muscle-specific kinase)

Chest MRI/CT: thymoma, lung tumour (Lambert Eaton)

Electromyography

**Treatment:** steroids, pyridostigmine, neostigmine

## 2. Neuromuscular Junction







### **3. Extraocular muscle disease**

## Extraocular muscle disease

Congenital/developmental

Tumour

Vascular

**Inflammatory**

Trauma

**Immune**

Other



# 3. Extraocular muscle disease

## Management of TED

Assessment of severity and activity

Thyroid function test, anti-thyroglobulin antibodies, anti-thyroid peroxidase antibodies

Treatment: general, then orbital, then strabismus, then lids

Steroids, thyroxine, smoking cessation, ocular artificial tears, orbital decompression, strabismus surgery to increase field of binocular vision, lid surgery to restore appearance



## 3. Extraocular muscle disease

## **Extraocular muscle disease**

Congenital/developmental

## **Tumour**

Vascular

## **Inflammatory**

## **Trauma**

## **Immune**

Other

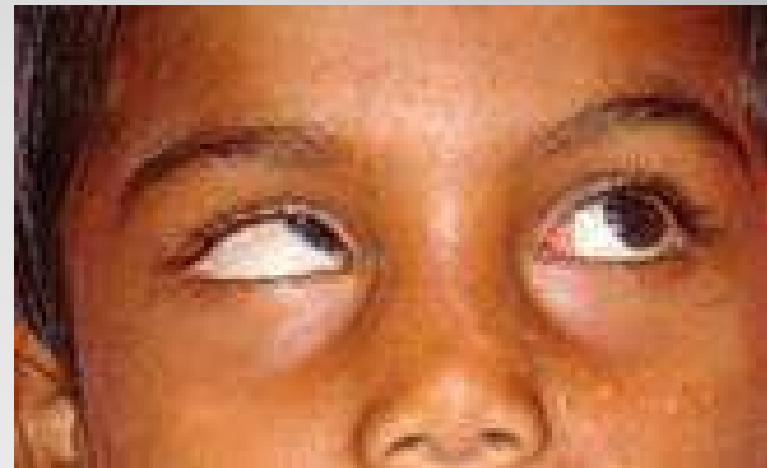
# **4. Orbital disease**



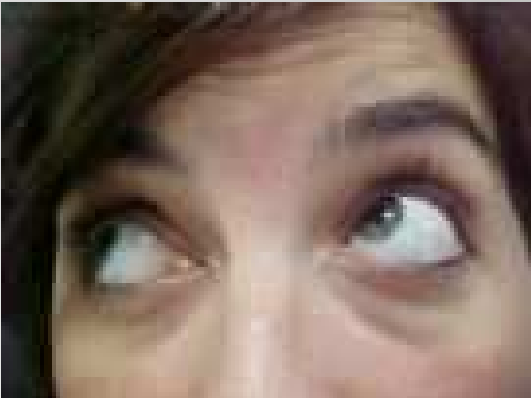
1. Apparent oblique muscle dysfunction
2. Paresis

**Cyclovertical misalignment**

- Inferior oblique overaction
- Very common, in particular in association with childhood strabismus
- Asymptomatic: others notice



**Cyclovertical muscle dysfunction**



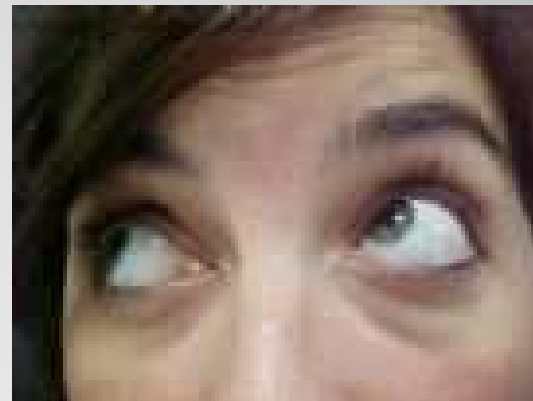
**New case**



Vertical double vision

Worse when looking to one side

Better when tilting head



**New case**

## Causes of fourth nerve palsy

Most common: Congenital

Most common acquired: head injury

less common: vascular (diabetes, hypertension, atherosclerosis)

Watch out for:

Giant cell arteritis

Cavernous sinus mass

Tumour

Multiple sclerosis, sarcoidosis, vasculitis

**Usually  
longstanding and  
decompensating  
-> diplopia**

**If in doubt refer  
urgently**

# Fourth nerve palsy

## Investigations for fourth nerve palsy

History: old photos head tilt?

Orthoptic assessment: vertical fusion range

Check blood pressure, blood sugar

Check full blood count, inflammatory markers, renal function, cholesterol

Fundoscopy, Ishihara, neuro exam

Decide whether imaging is needed, and how urgently

Involve other hospital specialists if underlying condition identified

## What will we do?

## Management for fourth nerve palsy

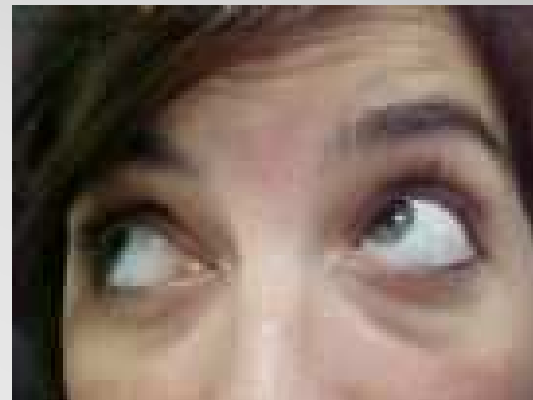
Treatment for any underlying condition

Ophthalmic:

prisms

occlusion

After 6-12 months of stable measurements: surgery



# What will we do?



## **Restrictive/Mechanical Strabismus**

Secondary to Muscular Disease

Associated with Orbital Bony Disease

Iatrogenic Cyclovertical Deviations (“Induced Adhesive Syndromes”)

## **Special forms of strabismus**

## Neuropathic conditions

- a) internuclear ophthalmoplegia
- b) supranuclear eye movement disorders
  - b1) Progressive supranuclear palsy
  - b2) Dorsal midbrain syndrome (Parinaud)
  - b3) Tonic gaze deviation
- c) Skew deviation
- d) Eye movement changes associated with Parkinson disease

## Special forms of strabismus

## Neuropathic conditions

### a) internuclear ophthalmoplegia

Lesion in the medial longitudinal fasciculus

Usually multiple sclerosis or microvascular

Limitation of adduction plus contralateral  
nystagmus on abduction

Usually improve spontaneously

Diplopia: occlusion. Long-term: surgery

## Special forms of strabismus



## Neuropathic conditions

### **b) supranuclear eye movement disorders**

#### **b1) Progressive supranuclear palsy**

Degenerative condition

Blurring of vision, photophobia

Slowing of saccades, then pursuits

Swallowing, speech, cognitive function, tone gait  
all progressively impaired

#### b2) Dorsal midbrain syndrome (Parinaud)

#### b3) Tonic gaze deviation

## Neuropathic conditions

### **b) supranuclear eye movement disorders**

b1) Progressive supranuclear palsy

### **b2) Dorsal midbrain syndrome (Parinaud)**

Posterior commissure lesion: pineal gland,  
hydrocephalus

loss of upgaze, Bell's phenomenon

Convergence-retraction nystagmus on attempted  
upgaze

Lid retraction (Collier sign)

Pupils: light-near dissociation

Convergence paralysis

b3) Tonic gaze deviation

## Neuropathic conditions

### **b) supranuclear eye movement disorders**

b1) Progressive supranuclear palsy

b2) Dorsal midbrain syndrome (Parinaud)

### **b3) Tonic gaze deviation**

Lesion in frontal eye field (infarct)

sustained horizontal conjugate deviation

## Special forms of strabismus

## Neuropathic conditions

### **c) Skew deviation**

Vertical misalignment

lesion of the vestibular input into nuclei of third, fourth, sometimes sixth nerve nucleus

One eye hypotropic/excyclotorted

Fellow eye hypertropic/incyclotorted

## Special forms of strabismus

## Neuropathic conditions

### **d) Eye movement changes associated with Parkinson disease**

Convergence deficit

Sometimes lid lag on downgaze

Hypometric saccades

Impaired smooth pursuits

Saccadic intrusions

## Special forms of strabismus

## **Myopathic conditions**

- a) Myasthenia Gravis
- b) Lambert Eaton myasthenic syndrome
- c) Miller Fisher syndrome
- d) Chronic progressive external ophthalmoplegia
- e) Myotonic and oculopharyngeal dystrophy

## **Special forms of strabismus**

## Myopathic conditions

a) Myasthenia Gravis

b) Lambert Eaton myasthenic syndrome

**c) Miller Fisher syndrome**

Ophthalmoplegia, ataxia, areflexia

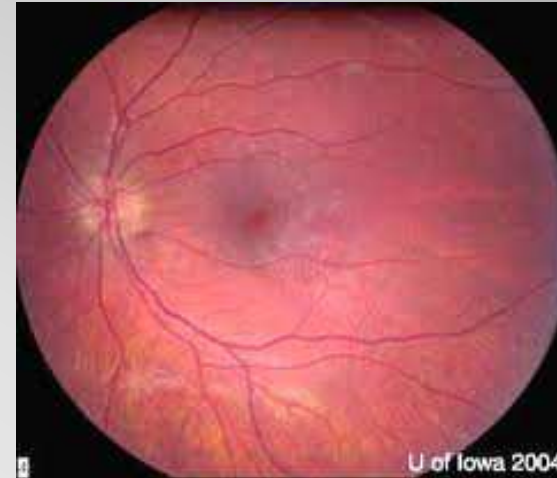
Auto-antibodies against ganglioside QG1b

## Special forms of strabismus

## Myopathic conditions

### d) Chronic progressive external ophthalmoplegia

Mutation in mitochondrial DNA:  
not enough ATP produced  
Ptosis, progressive paresis of eye  
muscles,  
retinal salt-and-pepper  
appearance,  
cardiac conduction defect  
(Kearns-Sayre)



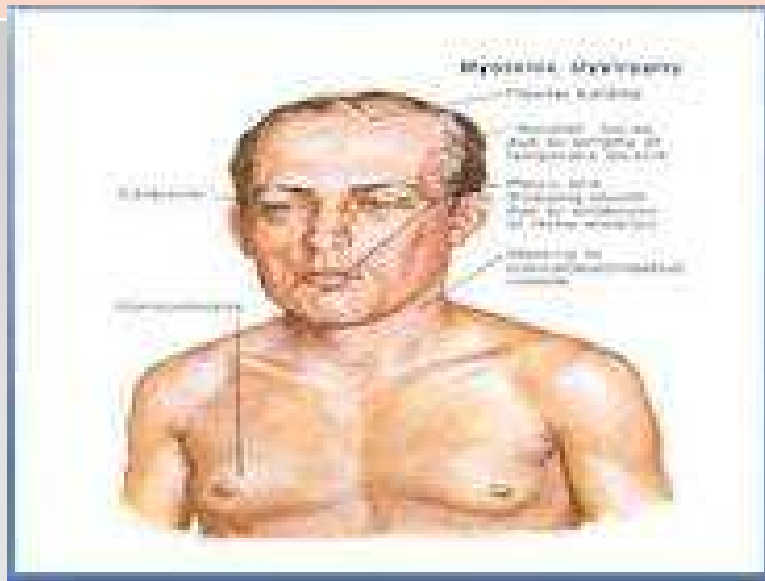
## Special forms of strabismus



## Myopathic conditions

### e) Myotonic and oculopharyngeal dystrophy

Expansion of unstable DNA trinucleotide repeats



## Special forms of strabismus

## **Congenital cranial nerve dysinnervation disorders**

1. Duane syndrome
2. Lower cranial nerve maldevelopment: Moebius sequence
3. Marcus Gunn Jaw-Eyelid Synkinesis Syndrome
4. Congenital Fibrosis of the Extraocular Muscles (CFEOM)
5. Restrictive Hypotropia in Adduction: Brown Syndrome

## **Special forms of strabismus**

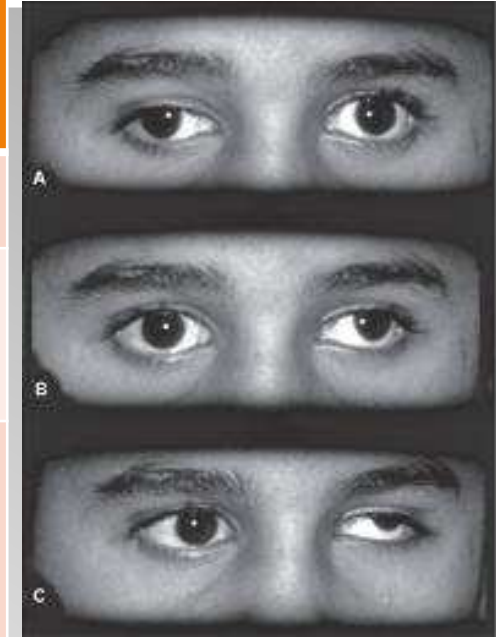
## Congenital cranial nerve dysinnervation disorders

### 1. Duane syndrome

Missing development of abducens nucleus

Lateral rectus either not innervated, or innervated by branch from oculomotor nerve, usually inferior division

Result: deficit of abduction, sometimes deficit of adduction, narrowing of palpebral fissure on horizontal gaze; abnormal head posture



## Special forms of strabismus

## Congenital cranial nerve dysinnervation disorders

### 2. Lower cranial nerve maldevelopment: Moebius sequence

Sixth and seventh nucleus maldeveloped

Plus additional nuclei affected (swallowing, speech etc)

## Special forms of strabismus



## Congenital cranial nerve dysinnervation disorders

### 3. Marcus Gunn Jaw-Eyelid Synkinesis Syndrome

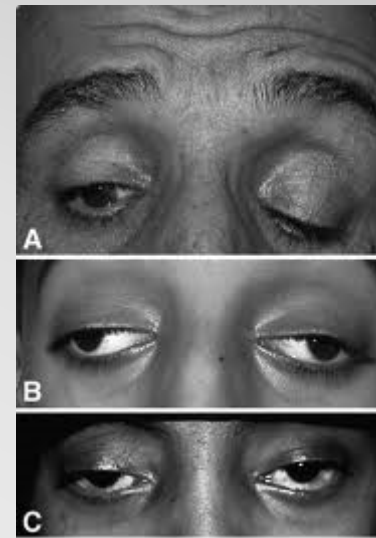
Maldevelopment of lid innervation  
Levator palpebrae instead supplied  
by nerve providing input to  
muscles of mastication  
Result: eyelid lifts when chewing  
or sucking



## Special forms of strabismus

## Congenital cranial nerve dysinnervation disorders

### 4. Congenital Fibrosis of the Extraocular Muscles (CFEOM)



Special forms of strabismus

## Congenital cranial nerve dysinnervation disorders

### 5. Restrictive Hypotropia in Adduction: Brown Syndrome



**Special forms of strabismus**







- Acquired
- Oscillopsia
- Central/Vestibular causes
- Drugs, alcohol, medication, thiamine deficiency
- Downbeat: posterior fossa malformation, cerebellar ectopia (Arnold Chiari)
- Seesaw (chiasmal, posterior fossa, trauma)
- Periodic alternating: cerebellar, visual, idiopathic

## **Pathologic nystagmus and other oscillations**