



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**

| Esotropia | Exotropia |
|-------------------------------|---------------------------------|
| 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:

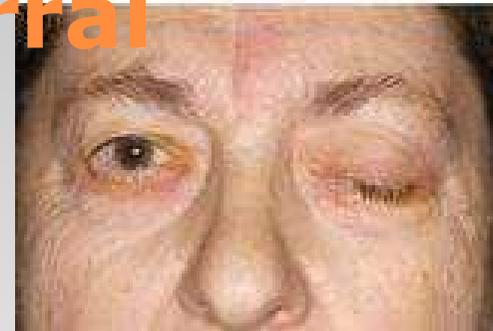
Giant cell arteritis

Cavernous sinus mass

Tumour

Multiple sclerosis, sarcoidosis, vasculitis

Urgent referral



Third nerve palsy

Investigations for third nerve palsy

Check blood pressure, blood sugar

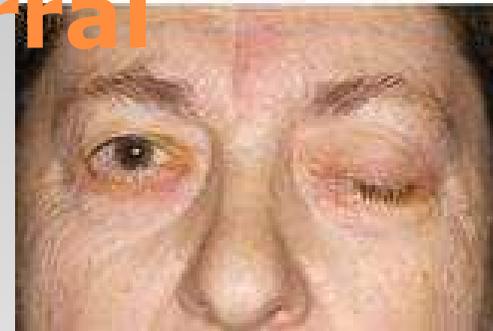
Check full blood count, inflammatory markers, renal function, cholesterol

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:

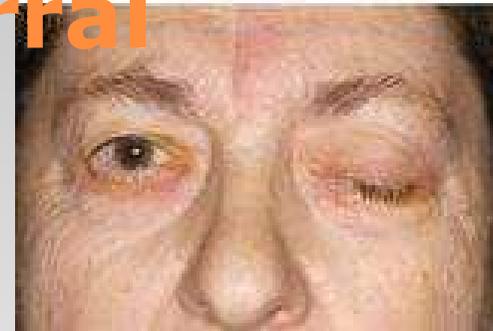
prisms

Occlusion if diplopia (usually ptosis)

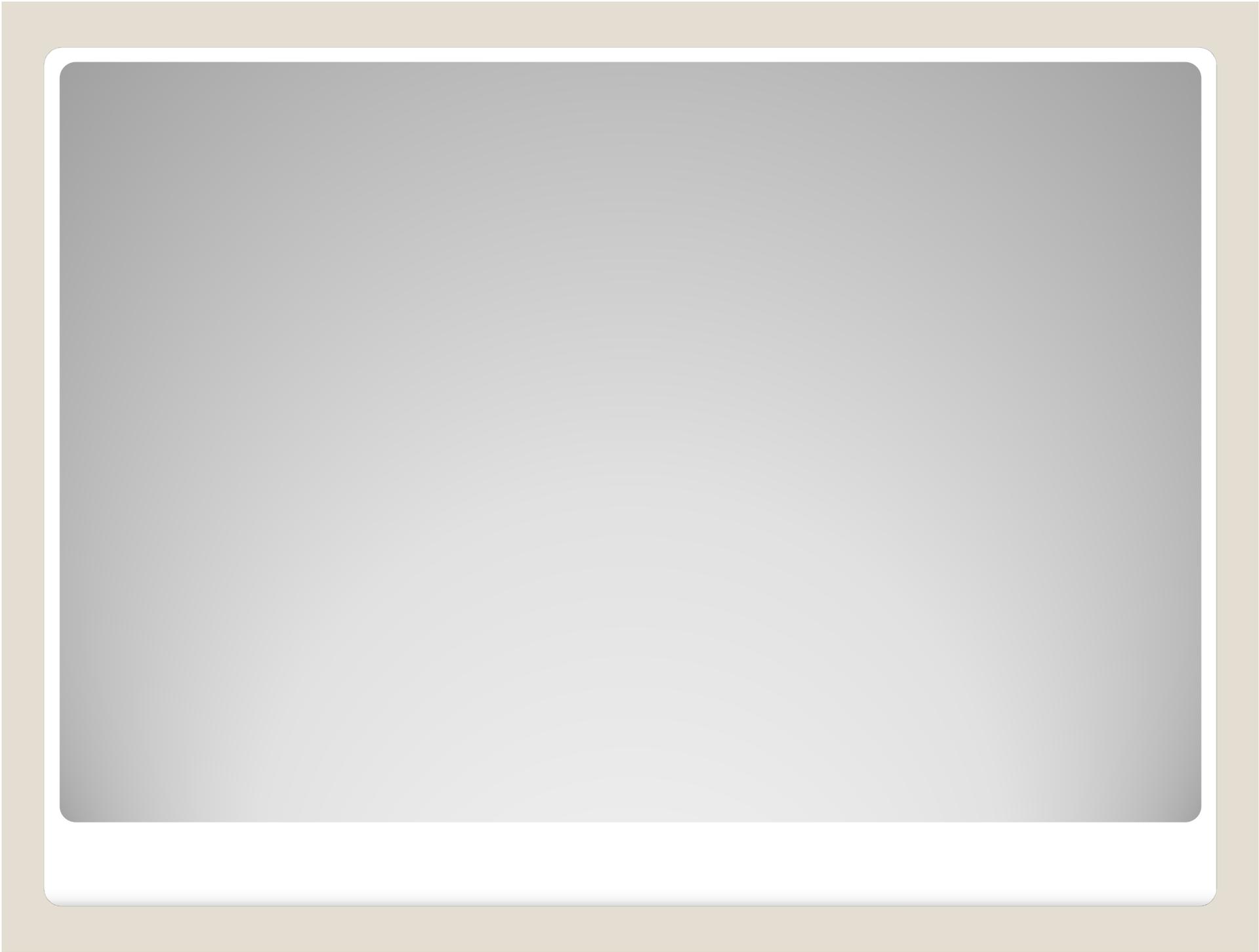
After 6-12 months of stable measurements: surgery

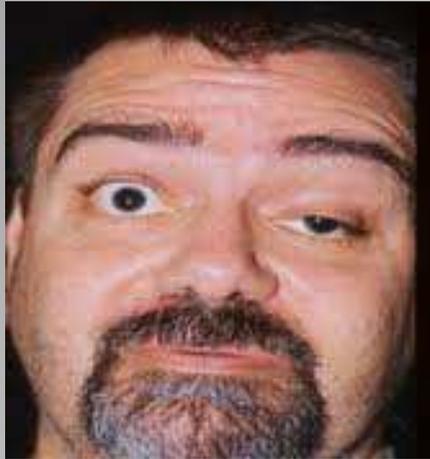
Botulinum toxin

Urgent referral



What will we do?

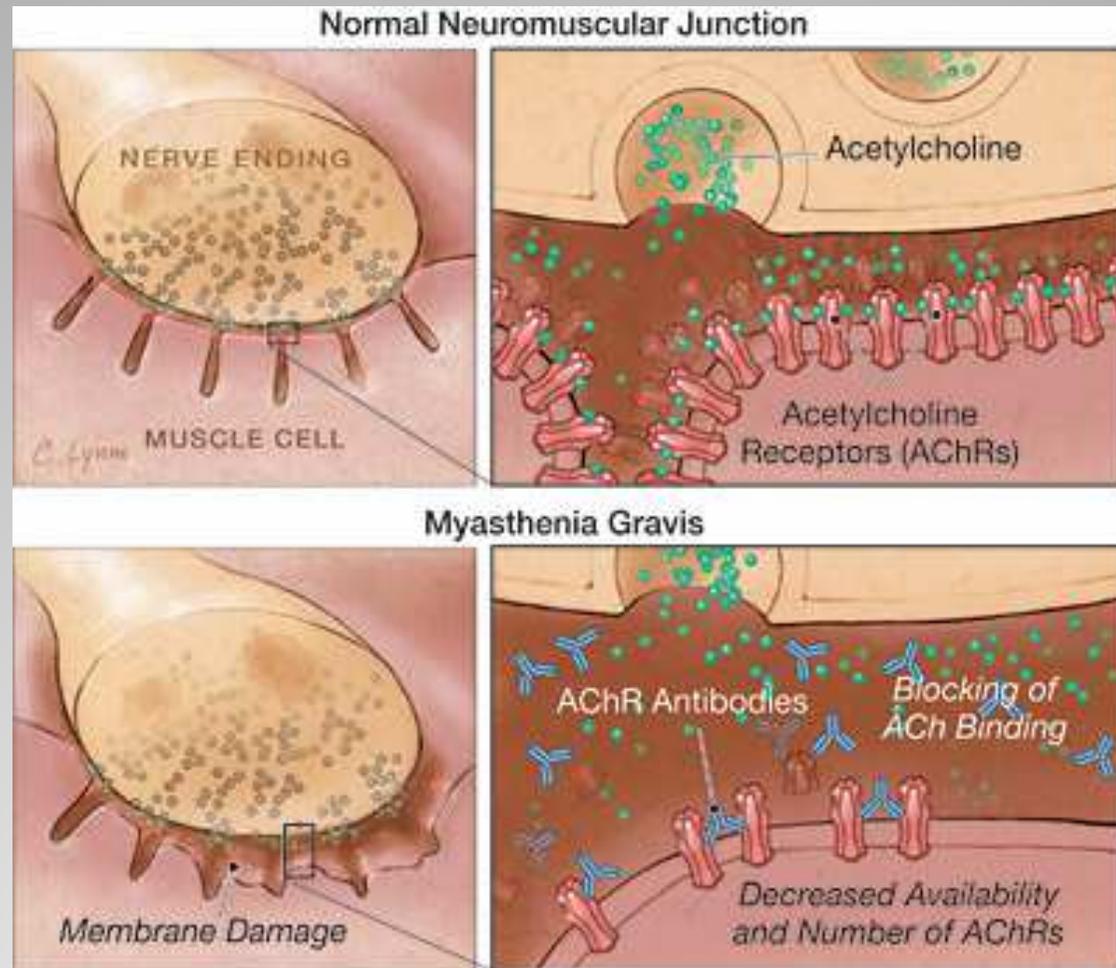




Myasthenia – Fatigue and Recovery Test 'Simpson plus'



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

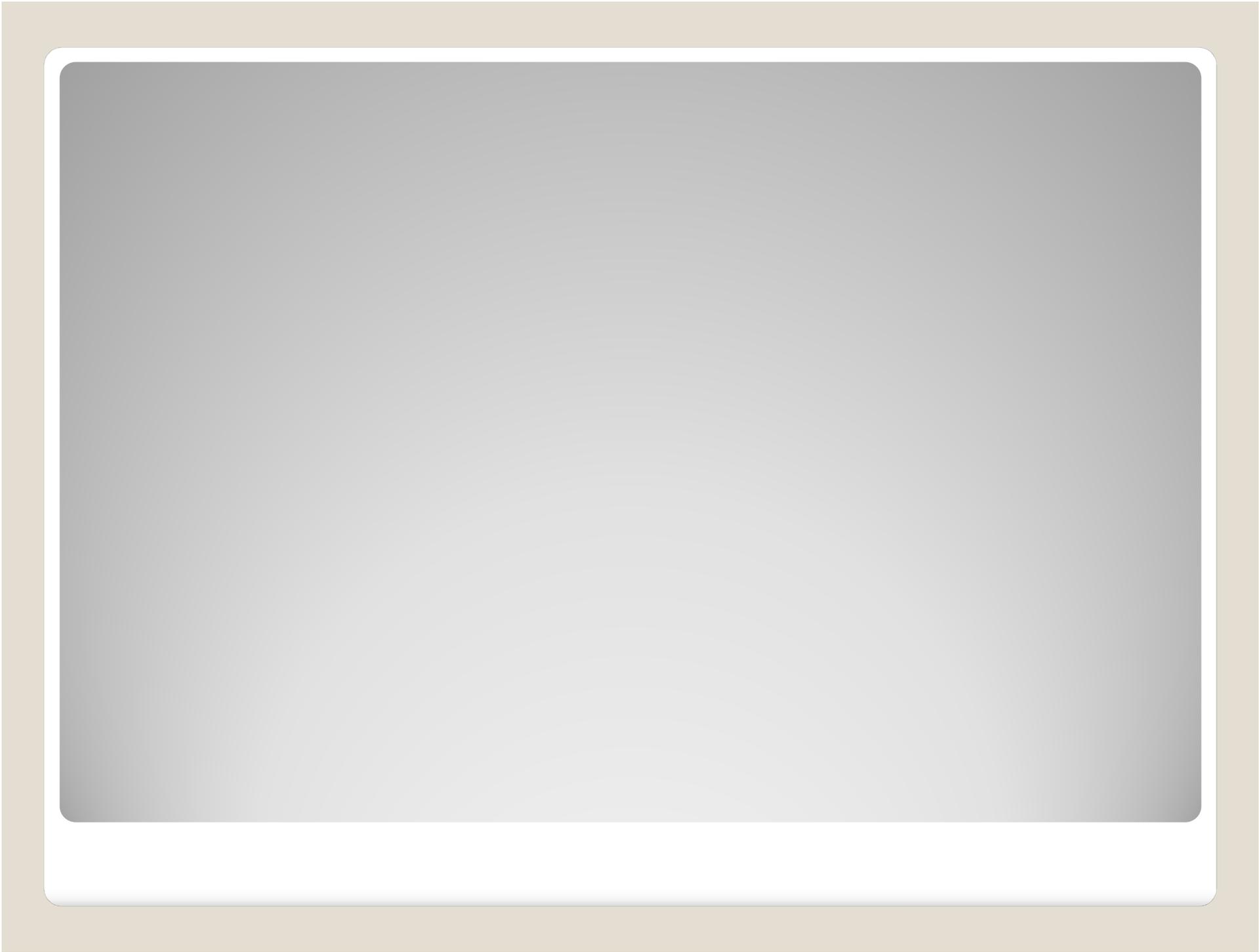
Tests: anti-acetylcholine receptor antibodies (negative in up to 50% of ocular only myasthenia), MuSK (muscle-specific kinase)

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

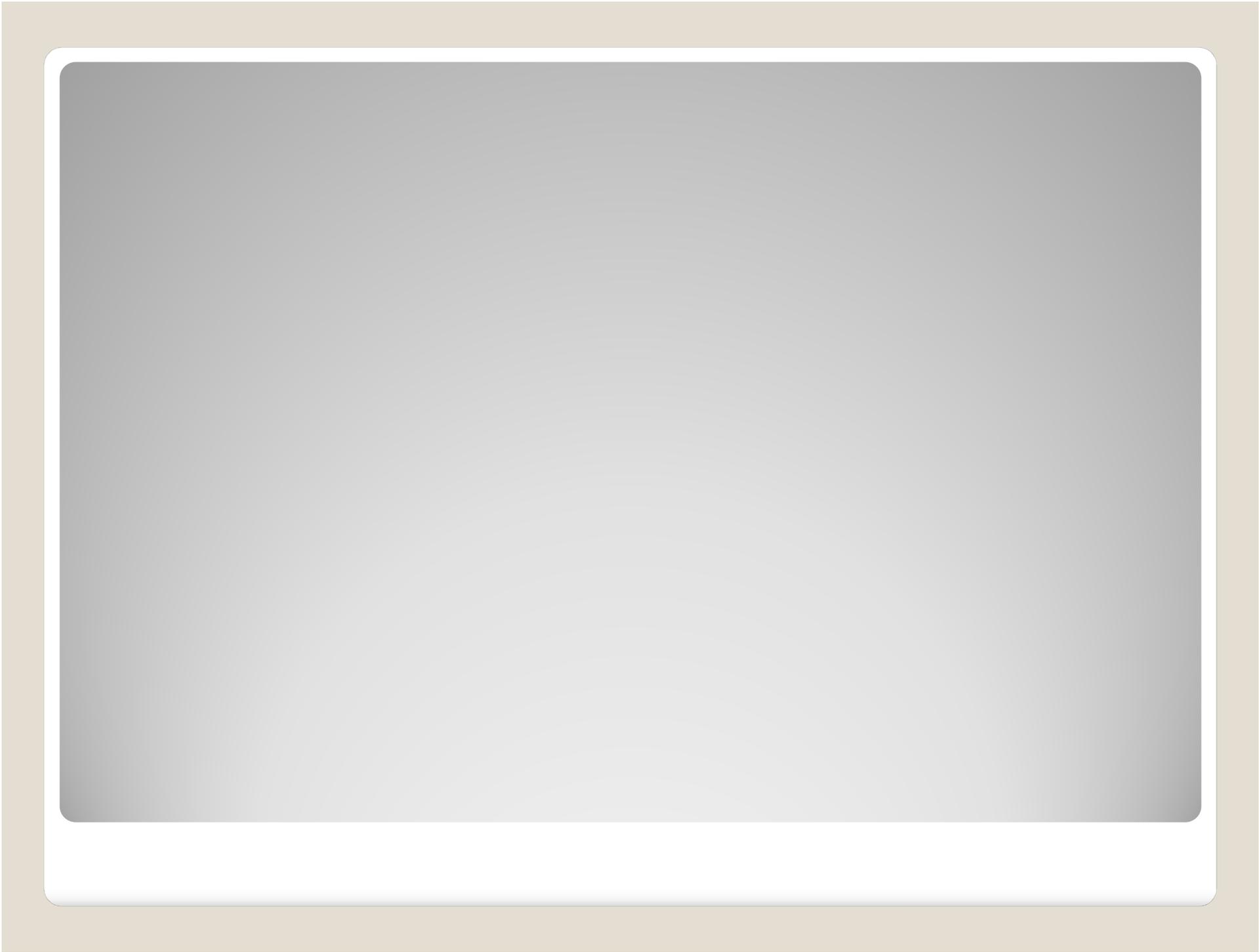
Inflammatory

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:

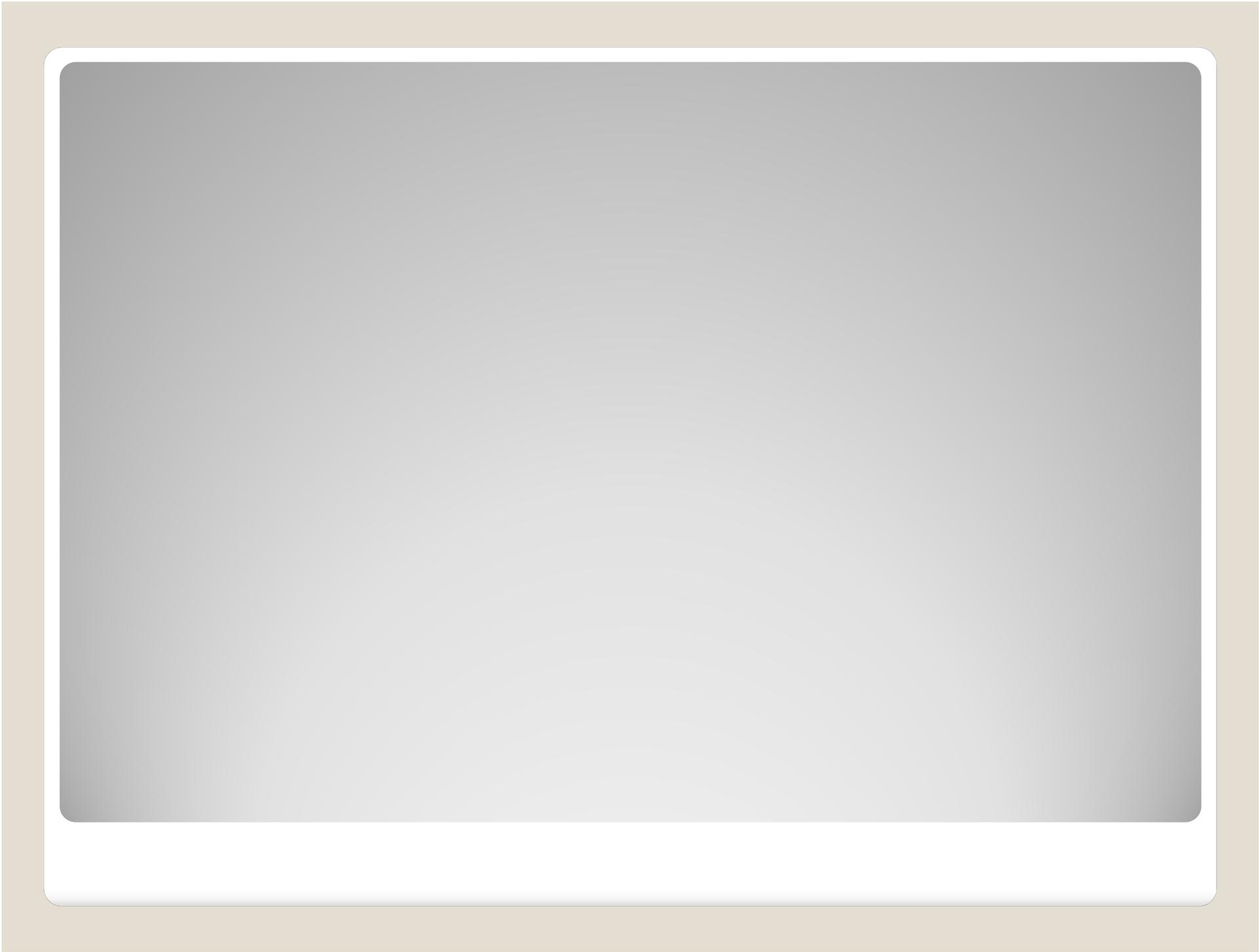
prisms

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

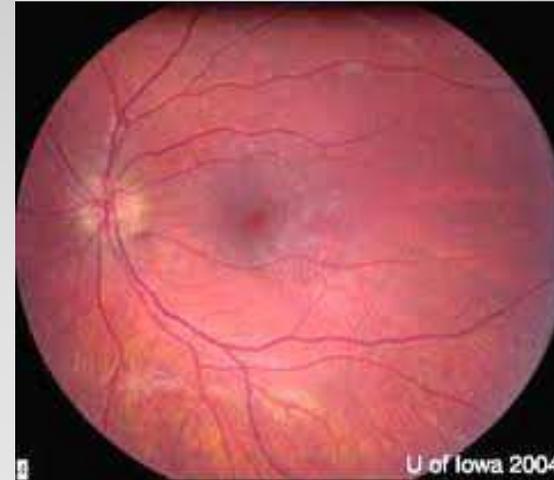
Auto-antibodies against ganglioside QG1b

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)

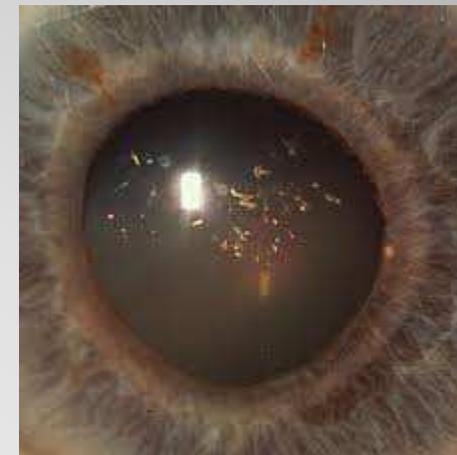
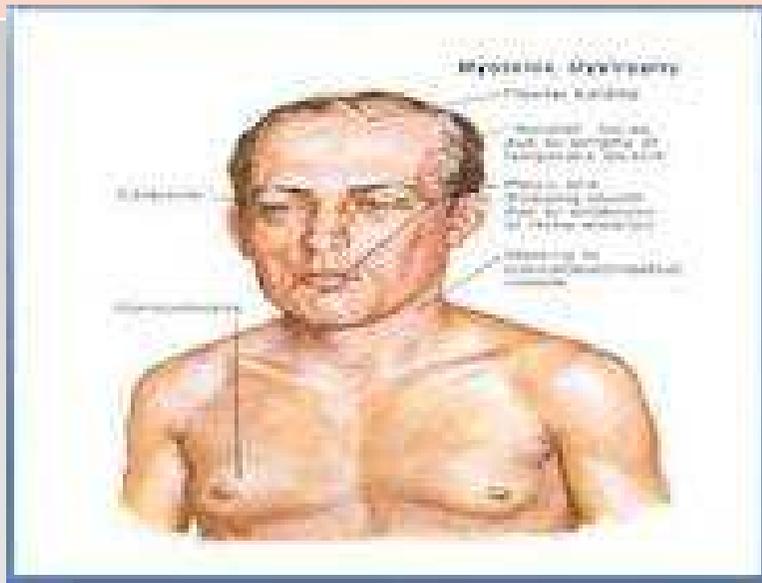


Special forms of strabismus

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

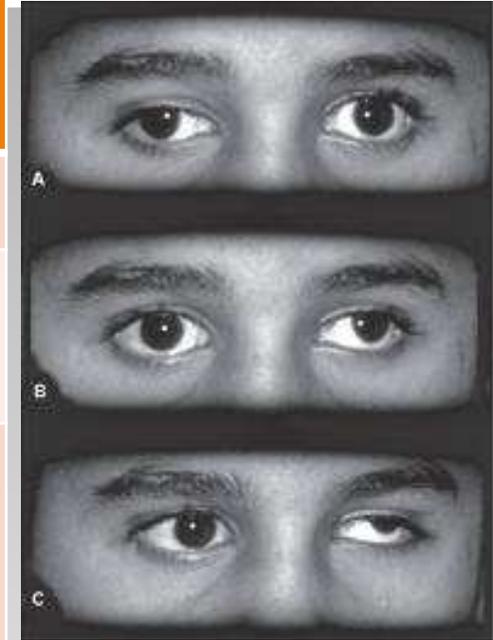
Congenital cranial nerve dysinnervation disorders

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

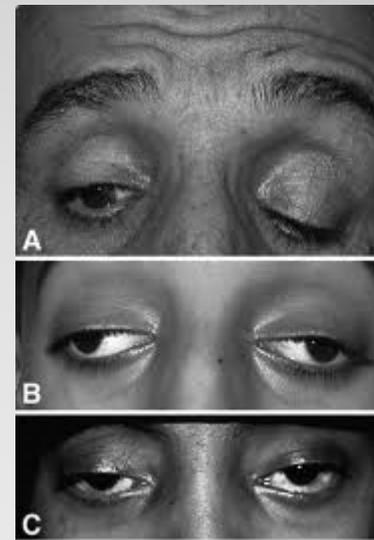
Maldevelopment of lid innervation
Levator palpebrae instead supplied
by nerve providing input to
muscles of mastication
Result: eyelid lifts when chewing
or sucking



Special forms of strabismus

Congenital cranial nerve dysinnervation disorders

4. Congenital Fibrosis of the Extraocular Muscles (CFEOM)



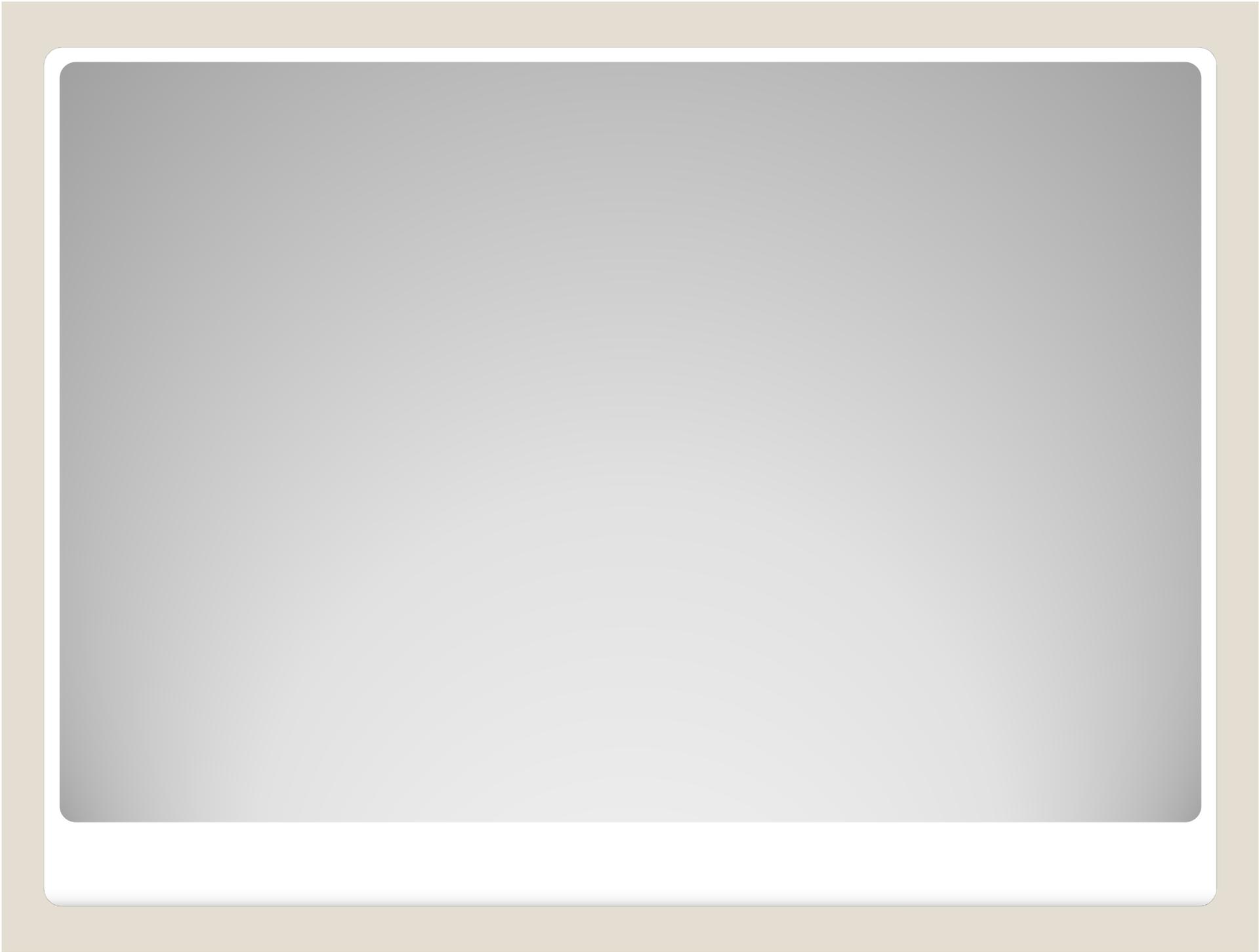
Special forms of strabismus

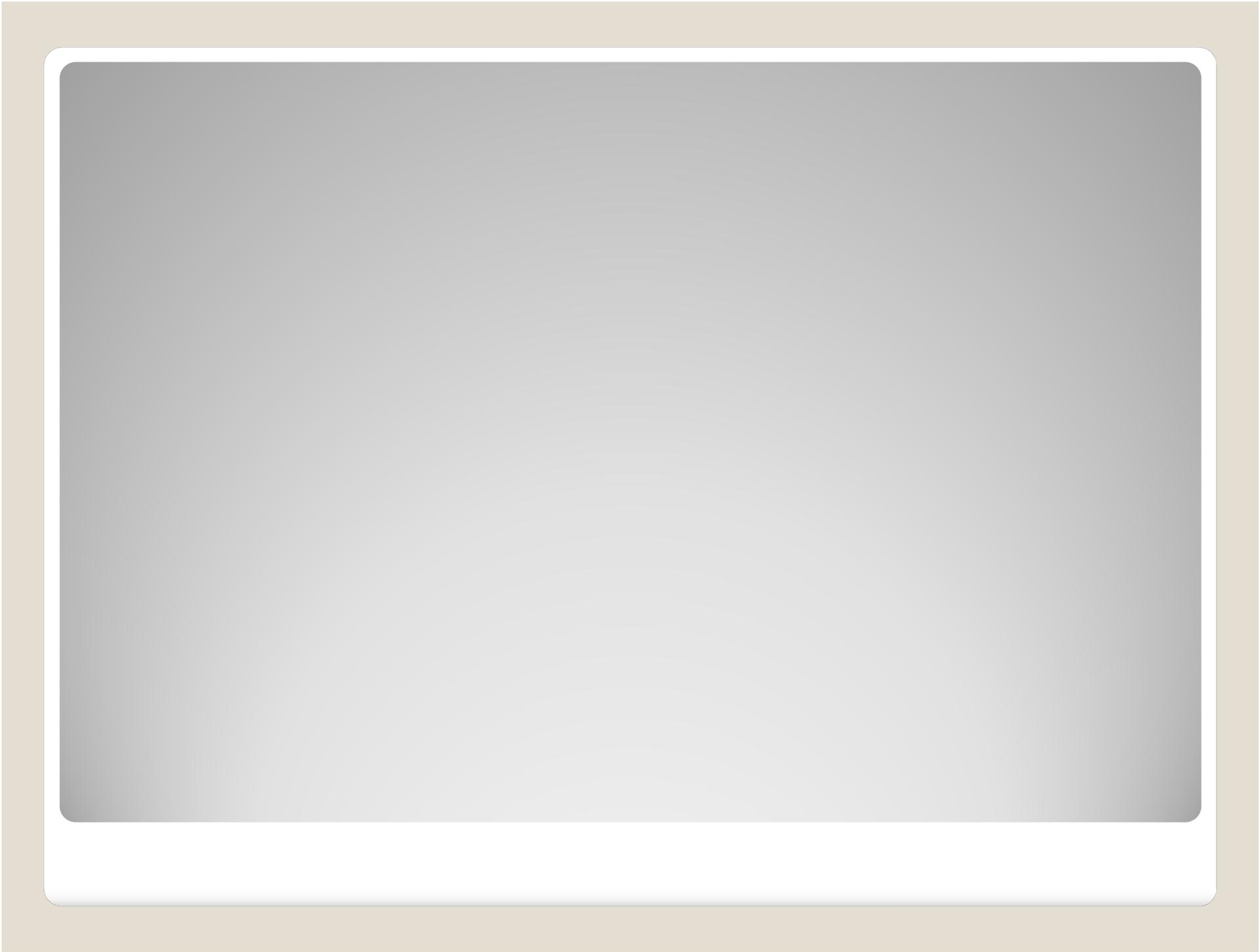
Congenital cranial nerve dysinnervation disorders

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 (chiasmatal, posterior fossa, trauma)
- Periodic alternating: cerebellar, visual, idiopathic

Pathologic nystagmus and other oscillations