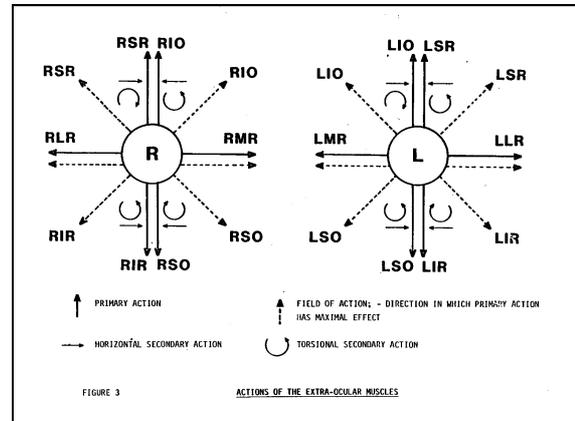


Incomitancy in Practice

Niall Strang

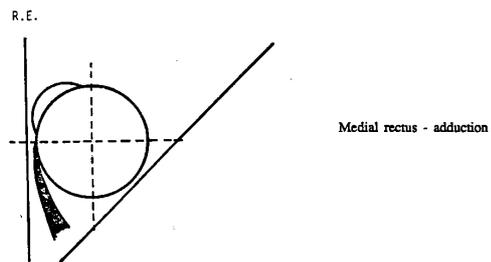
n.strang@gcu.ac.uk



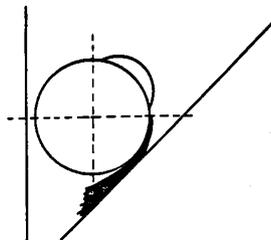
ANATOMICAL CONSIDERATIONS

- There are 6 extraocular muscles – 4 rectus muscles, 2 oblique muscles
- Length of each = 40 mm, the inferior oblique being slightly shorter
- 5 muscles arise from the apex of the orbit, the inferior oblique arises from the inferonasal angle of the orbit
- The 4 recti muscles originate from the apex of the orbit at the level of the Annulus of Zinn
- The recti muscles are inserted in front of the ocular equator, the obliques are inserted behind
- Movements occur about 3 primary axes around the centre of rotation – the vertical, horizontal and sagittal axes
- The action of a muscle depends on the angle of its plane and the antero-posterior axis of the eye. It follows that the action of the muscle may vary according to the positions of the globe in the orbit.

Medial Rectus

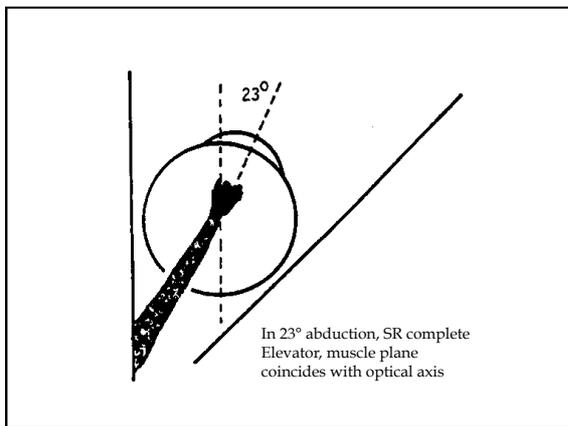
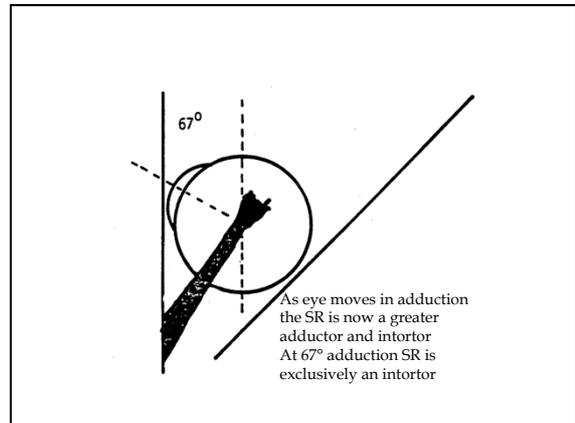
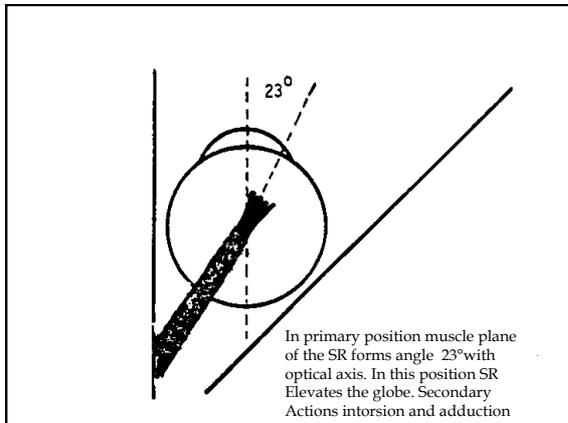


Lateral Rectus : abduction



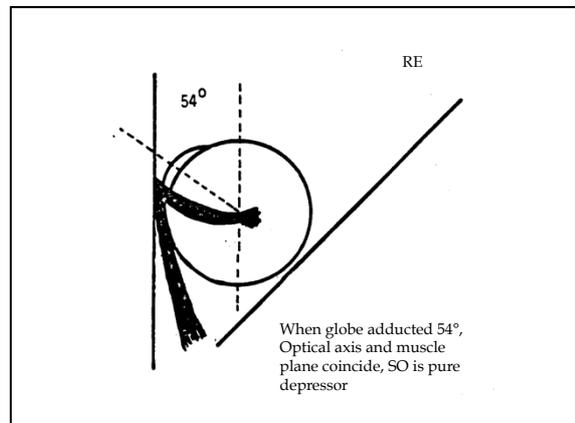
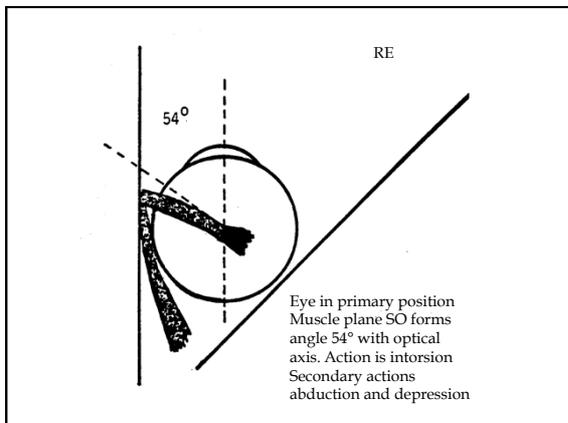
Superior Rectus

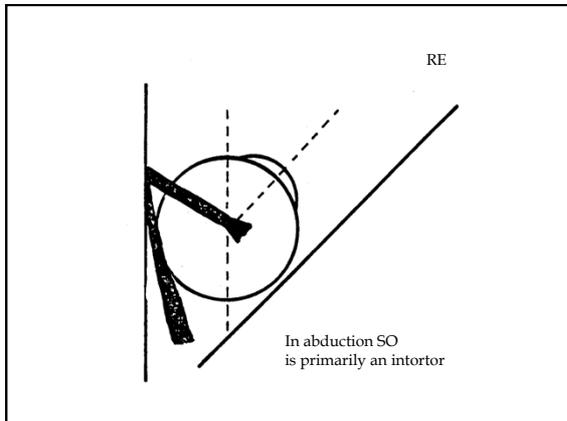
- In the primary position the muscle plane of the SR forms an angle of 23° with the optical axis.
- In this position the SR elevates the globe.
- Secondary actions are intorsion and adduction.
- As the eye moves in adduction the SR is now a greater adductor and intortor
- In 67° adduction the SR is exclusively an intortor.
- In 23° abduction the SR is a complete elevator. The muscle plane coincides with the optical axis.



Superior Oblique

- Eye in the primary position, the muscle plane SO forms an angle of 54° with the optical axis.
- The primary action is intorsion
- The secondary action is abduction and depression.
- When the eye is adducted 54° the optical axis and muscle plane coincide and the SO is a pure depressor.
- In abduction the SO is primarily an intortor.





Inferior Rectus

- With the eye in the primary position the IR forms an angle of 23° with the optical axis.
- Thus the relationship is the same as the SR except that it is an inferior rectus and therefore depresses the eye
- Secondary actions = extorsion and adduction.
- As adduction increases the depressor ability decreases and extorsion increases.
- In 67° abduction IR = exclusively extortor
- In 23° abduction IR = exclusively a depressor

Inferior Oblique

- When the eye is in the primary position, the muscle plane of the IO forms an angle of 51° with the optical axis.
- the relationship is almost the same as the SO, except by virtue of the muscles anatomical position, the action is extorsion.
- Secondary actions are abduction and elevation
- When the eye is adducted 51° the muscle is still an extortor but the elevator action increases
- In abduction the IO extorsion ability increases.

Rule for the secondary actions of the vertical muscles

- RADSIN = Recti ADduct Superiors Intort
- Therefore you can work out that the obliques are abductors and the inferiors are extortors

INVESTIGATION OF INCOMITANCY

-
-
-
-

directions of gaze

- **Hess Screen Plots**

Motility

- Both eyes move smoothly and follow the target across the horizontal, and there is no narrowing of the palpebral apertures
- There is a corresponding lid movement accompanying the vertical movements, and there is no A and V pattern
- There is no restriction of the movement of the eye in any direction of gaze
- Aid detection of incomitancy by: asking for subjective doubling
- Cover test in different directions of gaze
- Observing corneal reflexes

Lateral Rectus

- Greatest defect occurs on attempts to abduct the paretic eye
- Usually esotropia in the primary position
- Head turn towards palsied side

Medial rectus

- Isolated paresis is rare
- Greatest defect occurs when palsied eye adducts
- Usually exotropia in primary position
- Head turn is towards sound side

Superior Rectus

- Isolated palsy is usually congenital
- Paretic eye is affected in elevation and abduction
- Paretic eye is hypotropic in the primary position
- Can be associated with weakness of the levator (psuedo-ptosis – usually disappears when the paretic eye fixates)
- Contralateral inferior oblique will overact

Inferior Rectus

- Isolated palsy is rare and usually congenital
- Greatest deviation on attempts to look downward with the paretic eye in abduction
- Unopposed antagonist (SR) causes the paretic eye to be incyclotropic and hypertropic in the primary position
- Head turns down and to the paretic side with tilt to the sound side

Inferior Oblique

- Least likely of the muscles innervated by the 3rd cranial nerve to be paralysed
- Greatest deviation when the patient attempts to elevate the adducted eye
- Overaction of the unopposed antagonist (SO) causes incyclotropia
- Nearly always congenital
- Head posture is fairly characteristic with head inclined towards the paretic side and face turned towards the sound side
- Often confused with Browns Tendon Sheath Syndrome

Superior Oblique

-
- Overaction of the antagonist inferior oblique causes the paretic eye to be hypertropic in the primary position
- Head position is characteristically tilted towards the uninvolved side and the chin is depressed

Incomitant deviations in the adult

systemic disease - acquired

Incomitant deviations in the adult

traumatic orbital or head injury

palsies - head, rarely traumatic 111
Post retinal detachment - ocular

Incomitant deviations in the adult

Aetiology must always be elucidated.
Many will recover fully or partially over time if the systemic condition is treated. Traumatic palsies frequently recover as well.
Decompensation of congenital palsies (AHP, diplopia)

Congenital / infantile incomitant deviations

Duane retraction syndrome
Brown's
Bilateral 6th nerve palsy
Superior oblique palsy/ inferior oblique overaction
A & V patterns

A & V patterns

AHP may aid control, but deviation large need surgery, especially if deviation larger on depression.

Prisms in bifocal segment can be tried

Fourth Nerve (or Superior Oblique) Palsy

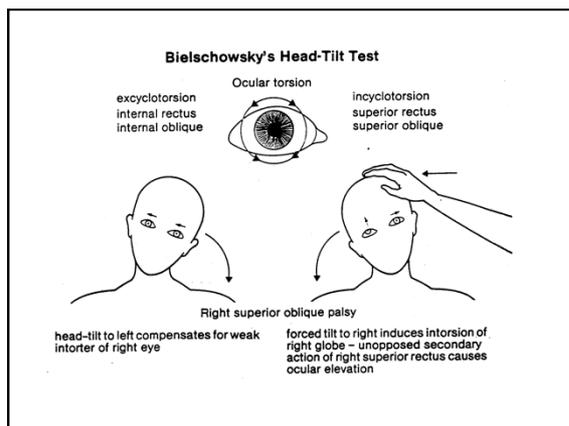
- Common as both congenital and acquired
- Can be bilateral or unilateral

Characteristics

- Bielschowsky Head Tilt Test : this differentiates SO palsy from the contralateral SR Palsy
- Unilateral palsies:
- affected eye hypertropic and slightly esotropic
-

AHP

- Unilateral:
- (I) Head tilt to sound side
- (ii) Face turn to sound side
- (iii) Chin Depression
- All are to overcome the vertical diplopia
- Bilateral: Chin depression



Management

- Acquired unilateral palsy = vertical prism
- Others = surgery
- 90% of isolated unilateral palsies (except some traumatic ones) recover spontaneously within 6 months.

Bilateral 4th Cranial Nerve Palsies

- ◆ Following trauma as the nerve emerges at the back of the skull (whip lash or falls on back of head).
- ◆ Torsion
- ◆ Vertical diplopia especially on depression.
- ◆ Very difficult to manage.

Sixth Nerve (Lateral Rectus) Palsy

- Common
- Ocular Posture esotropia on distance fixation with less for near (or only phoria at near)

Management

- Prism base out to distance portion of bifocals
- Botulinium toxin A injection into MR reduces esotropia to alleviate diplopia and prevents contracture of ipsilateral MR
- Occlusion to prevent amblyopia in children
- Surgery

3rd Nerve Palsy (Ophthalmoplegia)

Classification

- Complete Oculomotor Palsy affects all extra- and intra- ocular muscles.
- Divergent strabismus with slight depression,
- ptosis,
- mydriasis,
- loss of pupil action
- accommodation

Management

- Prisms – limited use (diplopia only present if incomplete ptosis)
- Botulinum toxin A – injection into LR can be helpful
- Pilocarpine 0.1% to reduce photophobia
- Surgery

Duane retraction syndrome

Huber 's classification 1974

- *abdn limitation, addn OK, SOT or SOP (3x more common)*
- *Type 2 marked addn limitation, abdn OK, XOT unilateral cases, XOP in bilateral cases*
- *Type 3 abdn and addn limited*

Duane retraction syndrome

- achieve BSV
- Hypermetropia - up to 81% Anisometropia 23%
- Amblyopia - quoted in 3 - 25% (14%)
- Female to male 3:2
- LE:RE 3:1, 20% bilateral
- Incidence in strabismic population 1- 4%

Duane retraction syndrome

management

- ⚡prescribe any significant refractive prescription
- ⚡treat amblyopia
- ⚡if AHP slight and BSV leave only op if marked
- ⚡cosmesis usually OK
- ⚡convergence exercises
- ⚡usually BSV or ABSV and leave alone

Brown's syndrome

- distance between the insertion of the superior oblique tendon and the trochlea cannot be shortened
- usually acquired - often no known reason
- difficulty elevating the eye in adduction
- often improves with time
- AHP - chin elevation or tilt to affected side
- steroid injections into area of trochlea

Hess Screen Plots

- Compare the size of the fields
- the affected eye corresponds to the smaller field – the involved eye shows the greatest under-action and smallest over-action compared with the non-involved eye
- Greater difference in size will be found in mechanical or recent onset neurogenic deviations
- In longstanding neurogenic defects the full sequelae is present – spread of incomitance = smaller difference in plots between eyes
- Mechanical vs Paralytic Strabismus
- Mechanical (and recent onset palsy) only shows first and second parts of the sequelae
- Mechanical deviations failure is more abrupt – making the defect small in the central field in comparison to the outer field

