**Learning Objectives:**

1. Identify how to correctly perform the “Muscle H” test on a patient
2. Know which **paired muscles** are being ‘tested’ in each cardinal position
3. Understand how to perform the **Cover Test** in the proper order
4. Identify the differences between orthophoria, heterophoria, & heterotropia

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**Extraocular Motility & Cover Testing**

**Lecturer:** M. Patrick COLEMAN, ABOC, COT

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**Let’s get oriented first…**

- **Superior** = UPWARD (or TOP)
- **Inferior** = DOWNWARD (or BOTTOM)
- **Nasal / Medial** = TOWARD NOSE
- **Temporal / Lateral** = TOWARD TEMPLE
- **Posterior** = BEHIND (or Toward the BACK)
- **Anterior** = IN FRONT (or Toward the Front)

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**EXTRAOCULAR MUSCLES**

- **Six (6) muscles** for each eye
- They **attach to the sclera**
- “Job” is to keep objects of interest lined up with the macula of each eye
  - **Goal?**: Single Binocular Vision (SBV)
  - **Want to avoid**: diplopia or suppression resulting in monocular vision.
  - “Primary Position of Gaze” = Straight Ahead

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**EXTRAOCULAR MUSCLES (cont.)**

**All 6 of them displayed**

- **RECTUS MUSCLES**
  - Four (4) of them
  - Attach **ANTERIOR** to equator
  - Do just what they “say”:
    - **SUPERIOR** Rectus (SR) makes eye look superiorly, or UP; (ELEVATION)
    - **INFERIOR** Rectus (IR) makes eye look inferiorly, or DOWN; (DEPRESSION)
    - **LATERAL** Rectus (LR) makes eye look laterally (i.e. toward the TEMPLE side); **ABDUCTION**
    - **MEDIAL** Rectus (MR) makes eye look medially (i.e. toward the NASAL side); **ADDITION**
OBLIQUE Muscles are "unique"
- Two (2) of them
- Attach POSTERIOR to equator
- Move the eyes in the OPPOSITE direction of what they "say":
  - SUPERIOR OBLIQUE (SO) makes the eye look inferior, or DOWN (Depression), & across the nose
  - INFERIOR OBLIQUE (IO) makes the eye look superior, or UP (Elevation), & across the nose

OBLIQUE Muscles perform a unique action:
- INTORSION (top of the eye rotates "in" toward the nose) = Superior Oblique
- EXTORSION (top of the eye rotates "out" toward the temple) = Inferior Oblique

How do you "test" the muscles & nerves?
- Muscles are 'innervated' by cranial nerves
- Nerves make the muscles "work"
- Which nerves 'operate' which muscles?  
  - LR6 SO4 3
  - Lateral Rectus (LR) is controlled by the VI (6th) CN (Abducens)
  - Superior Oblique (SO) is controlled by the IV (4th) CN (Trochlear)
  - All the rest (SR, MR, IR, and IO) are controlled by the III (3rd) CN (Oculomotor)
EXTRAOCULAR MUSCLES (cont.)

Each muscle can do even more than we’ve covered!

- We’ve talked only about the **PRIMARY ACTION** of the muscles.
- Most muscles have a **SECONDARY** action
- And some even have **TERTIARY** actions.

EXTRAOCULAR MUSCLES (cont.)

- Muscles can work “**SYNERGISTICALLY**”
  - Example: Superior Rectus (SR) **helps** the Inferior Oblique (IO)
- Each muscle has an “**ANTAGONIST**”
  - Example: Inferior Rectus (IR) “**fights**” or opposes the Superior Rectus (SR)

EXTRAOCULAR MUSCLES (cont.)

- **SACCADES**: Fixation, Re-Fixation, & Rapid Eye Movements
- **PURSUIT**: Slow, parallel movement that allows us to follow an object
  - (NOTE: Muscle-H Test checks “pursuits”)

EXTRAOCULAR MUSCLES (cont.)

- Our eyes are “**YOKED**” together.
- Where one eye goes, the other follows…

Next, the **COVER TEST**

- **Cover Testing** reveals a patient’s true, **binocular** alignment status:
  - **ORTHOPHORIA** = normal or “**perfect**” alignment
    or
  - **HETEROPHORIA** = a “**latent**” or hidden **misalignment**
    or
  - **HETERTROPIA** = a “**manifest**” or obvious **misalignment**
Cover Testing (cont.)

- COVER TESTING is done w/patient looking @ a DISTANT object (20 feet away) & then again while looking at a NEAR object (16" away)
- You want the patient to be looking through the correct Rx for the distance being tested!
  - That means if the patient is wearing a PAL or Bifocal, you want them to hold their glasses up for NEAR testing, so they can look straight through the near correction for evaluation

Cover Testing (cont.)

The **Cover Testing** has two “parts”:

- **PART 1** is the “**Alternating Cover Test**”
  - Tells you which way the patient’s eyes “deviate”:
    - **ESO** would be eyes deviating inward
    - **EXO** would be eyes deviating outward
    - **Hyper/Hypo** would be eyes deviating vertically:
      - One eye will deviate up; the other will deviate down
    - **ORTHO** would be eyes that do not have ANY misalignment & don’t move during testing (no deviation present!)

Cover Testing (cont.)

Cover Testing (cont.)

Cover Testing (cont.)

Cover Testing (cont.)

Cover Testing (cont.)

Cover Testing (cont.)

Cover Testing (cont.)

Cover Testing (cont.)

Cover Testing (cont.)

Cover Testing (cont.)

Cover Testing: Alternating test (cont.)

FIRST, do the **ALTERNATING** test:

- Pt looks at distant object (20 ft); both eyes open, wearing Rx (if needed)
- Move occluder from OD to OS; pausing for two seconds between movements, NEVER letting both eyes ‘see’ at the same time!
  - If there is no eye movement seen during alternating testing, patient has ORTHOPHORIA (“Ortho” for short) & you’re DONE! (test near now)
  - If you saw eye movement, record the deviation you observed: **ESO**, or **EXO**, or **Hyper/Hypo**
Proceed to the Cover/Uncover test to determine if patient has a heteroPHORIA or a heteroTROPIA.
Cover Testing: Cover/Uncover (cont.)

With patient looking @ distant object again, COVER the OS while observing the OD...

- Did the RIGHT (OD) eye move?
  - YES? That’s a TROPIA! (“UNCOVER” matters!)
  - NO? That’s a PHORIA...so far! Must test other eye to be sure (and “uncover” doesn’t matter)

With patient looking @ distant object again, COVER the OD, while observing the OS...

- Did the LEFT (OS) eye move?
  - YES? That’s a TROPIA! (“UNCOVER” matters!)
  - NO? That’s a PHORIA...and you are done! (and “uncover” doesn’t matter)

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Cover Testing (cont.)

This ‘chart’ can help simplify the COVER/UNCOVER portion of your testing...

<table>
<thead>
<tr>
<th>Number of times the observed eye moved during the cover/uncover test</th>
<th>Condition indicated</th>
</tr>
</thead>
<tbody>
<tr>
<td>No movement seen</td>
<td>PHORIA</td>
</tr>
<tr>
<td>One movement</td>
<td>ALTERNATING TROPIA</td>
</tr>
<tr>
<td>Two movements</td>
<td>UNI-LATERAL TROPIA</td>
</tr>
</tbody>
</table>

Defining terms:

- **Orthophoria**: Under conditions of disassociation, there is no deviation of the lines of sight of one eye from the other. In other words, both eyes remain directed toward the object of regard even if one eye is occluded. For the person with orthophoria, both eyes will be aligned correctly all the time, even if an occluder is placed in front of one eye.

- **Heterophoria**: Is a latent, or hidden condition. Heterophoria is detected when the eyes are disassociated (i.e., one eye is occluded). If the covered eye assumes a position of deviation (i.e., it turns in, up, down, or out) in relation to the eye not covered, then the patient has a latent muscle deviation (heterophoria). Upon removal of the cover (and a return to normal binocular vision) the eye that was deviated will almost immediately return to normal alignment with the other eye. The muscle deviation that occurs in heterophoric patients, only happens as a result of dissociation (the covering of one eye). When the eyes are left alone, they remain correctly aligned.

- **Heterotropia**: Is a manifest, or obviously seen condition. It is often called strabismus, squint, wandering eye, or tropia. Heterotropia is when the line of sight of the two eyes fail to align correctly, at the same time, on the object of fixation. If one eye fixates on (looks at) an object, and the other eye is looking off to the left, right, above, or below the object of regard, the patient is said to have a heterotropia. In heterotropia, the misalignment of the two eyes is always present regardless of whether the eyes are dissociated or not.