With regard to strabismus: What does the word comitant mean?
Vertical Deviations

With regard to strabismus: What does the word comitant mean? It means an ocular misalignment is the same in all fields of gaze.
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Do vertical deviations tend to be comitant, or incomitant?
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What is spread of comitance?
Vertical Deviations

With regard to strabismus: What does the word comitant mean? It means an ocular misalignment is the same in all fields of gaze.

Do vertical deviations tend to be comitant, or incomitant? Incomitant (although spread of comitance can occur).

What is spread of comitance? The neuroadaptive process in which an initially incomitant deviation gradually becomes comitant.
Vertical Deviations

The Peds book divvies the vertical deviations into two broad categories—what are they?
Vertical Deviations

2° to oblique dysfunction

Uncertain mechanism

*The Peds book divvies the vertical deviations into two broad categories—what are they?*
Vertical Deviations

2° to oblique dysfunction? Uncertain mechanism?

Which is the more common cause of vertical deviations?
Which is the more common cause of vertical deviations?
Oblique dysfunction
In turn, the vertical deviations 2° dry to oblique dysfunction are themselves divided into two categories. What are they?
In turn, the vertical deviations secondary to oblique dysfunction are themselves divided into two categories. What are they?
Vertical Deviations

2° to oblique dysfunction

- Superior Oblique (SO)
- Inferior Oblique (IO)

Uncertain mechanism

Per the Peds book, what are the three basic forms of SO dysfunction leading to a vertical deviation?
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

- Overaction
- Palsy
- Brown syndrome

Inferior Oblique (IO)

Uncertain mechanism

Per the Peds book, what are the three basic forms of SO dysfunction leading to a vertical deviation?
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

What is the classic exam finding in SO overaction?

Overaction

- Palsy
- Brown syndrome

Uncertain mechanism

Will vertical misalignment be present in primary gaze?

It will if the overaction is unilateral or asymmetric.

What is the surgical treatment for SO overaction?

Tenotomy vs silicone expander

Why are surgeons reluctant to operate on a patient with bifixation?

Surgery could result in torsional diplopia
**Vertical Deviations**

2° to oblique dysfunction

Superior Oblique (SO)

**Overaction**
- Palsy
- Brown syndrome

Uncertain mechanism

*What is the classic exam finding in SO overaction?*

Overdepression of the eye in adduction
Vertical Deviations

Bilateral superior oblique overaction
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Overaction

What is the classic exam finding in SO overaction?
Overdepression of the eye in adduction

Will vertical misalignment be present in primary gaze?

Uncertain mechanism
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Overaction

- Palsy
- Brown syndrome

What is the classic exam finding in SO overaction?
Overdepression of the eye in adduction

Will vertical misalignment be present in primary gaze?
It will if the overaction is unilateral or asymmetric.

Uncertain mechanism

Tenotomy vs silicone expander

Why are surgeons reluctant to operate on a patient with bifixation?
Surgery could result in torsional diplopia.
Vertical Deviations

- 2° to oblique dysfunction
  - Superior Oblique (SO)
  - Overaction
    - Palsy
    - Brown syndrome
  - Uncertain mechanism

What is the classic exam finding in SO overaction?
Overdepression of the eye in adduction

Will vertical misalignment be present in primary gaze?
It will if the overaction is unilateral or asymmetric
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

- Overaction
  - Palsy
  - Brown syndrome

Uncertain mechanism

What is the classic exam finding in SO overaction?
Overdepression of the eye in adduction

Will vertical misalignment be present in primary gaze?
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What is the surgical treatment for SO overaction?
Vertical Deviations

*Superior Oblique (SO)*

- **2° to oblique dysfunction**
- **Overaction**
  - Palsy
  - Brown syndrome

**Uncertain mechanism**

**What is the classic exam finding in SO overaction?**
Overdepression of the eye in adduction

**Will vertical misalignment be present in primary gaze?**
It will if the overaction is unilateral or asymmetric

**What is the surgical treatment for SO overaction?**
Tenotomy vs silicone expander
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

- Overaction
  - Palsy
  - Brown syndrome

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Overdepression of the eye in adduction

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It will if the overaction is unilateral or asymmetric

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Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Overaction

- Palsy
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Overdepression of the eye in adduction

Will vertical misalignment be present in primary gaze?
It will if the overaction is unilateral or asymmetric

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Tenotomy vs silicone expander

Why are surgeons reluctant to operate on a patient with bifixation?
Surgery could result in 'direction' diplopia
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Overaction

- Palsy
- Brown syndrome

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Overdepression of the eye in adduction

Will vertical misalignment be present in primary gaze?
It will if the overaction is unilateral or asymmetric

What is the surgical treatment for SO overaction?
Tenotomy vs silicone expander

Why are surgeons reluctant to operate on a patient with bifixation?
Surgery could result in torsional diplopia
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Palsy

Overaction

Brown syndrome

What is the classic exam finding in SO palsy?
Vertical Deviations

2º to oblique dysfunction

Superior Oblique (SO)

- Overaction
- Palsy
- Brown syndrome

Inferior Oblique (IO)

What is the classic exam finding in SO palsy?
Overelevation of the eye in adduction

Uncertain mechanism
Vertical Deviations

Superior oblique palsy, right
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Uncertain mechanism

What is the classic exam finding in SO palsy?
Overerelevation of the eye in adduction

Is SO palsy a commonly-encountered entity?

Palsy

Brown syndrome
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Uncertain mechanism

What is the classic exam finding in SO palsy?
Overelevation of the eye in adduction

Is SO palsy a commonly-encountered entity?
Yes—it is the most common paralysis of a single cyclovertical muscle

Brown syndrome

Overaction

Palsy
Vertical Deviations

2° to oblique dysfunction

- Superior Oblique (SO)
  - Overaction
  - Palsy
    - Brown syndrome
  - Overerelevation of the eye in adduction

- Inferior Oblique (IO)
  - Uncertain mechanism

What is the classic exam finding in SO palsy?
Overerelevation of the eye in adduction

Is SO palsy a commonly-encountered entity?
Yes—it is the most common paralysis of a single cyclovertical muscle

Upon encountering a SO palsy, what question must you consider early on?
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)
- Overaction
- Palsy
- Brown syndrome

Inferior Oblique (IO)

Uncertain mechanism

What is the classic exam finding in SO palsy?
Overerelevation of the eye in adduction

Is SO palsy a commonly-encountered entity?
Yes—it is the most common paralysis of a single cyclovertical muscle

Upon encountering a SO palsy, what question must you consider early on?
Whether the palsy is congenital, or acquired
**Vertical Deviations**

2° to oblique dysfunction

**Superior Oblique (SO)**

**Inferior Oblique**

---

**Palsy**

---

**Overaction**

---

Regarding SO palsy: As a general rule:

--congenital SO palsy is much more likely to be **uni- vs bilateral**

--acquired SO palsy is much more likely to be **uni- vs bilateral**

Brown syndrome

Regarding SO palsy: As a general rule:

--congenital SO palsy is much more likely to be **uni- vs bilateral**

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1) Family-album biopsy (i.e., check old photos for a longstanding head tilt)

2) Assess for increased vertical fusional amplitudes

When diagnosing a unilateral SO palsy, what must you be sure to rule out?

That it’s not in fact an asymmetric bilateral SO palsy
Vertical Deviations

Regarding SO palsy: As a general rule:
--congenital SO palsy is much more likely to be **unilateral**
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2º to oblique dysfunction

Superior Oblique (SO) Inferior Oblique

--- Overaction

--- **Palsy**

--- Brown syndrome
**Vertical Deviations**

Regarding SO palsy: As a general rule:
--congenital SO palsy is much more likely to be **unilateral**
--acquired SO palsy is much more likely to be **bilateral**

What is the most common cause of acquired SO palsy?
Vertical Deviations

Regarding SO palsy: As a general rule:
--congenital SO palsy is much more likely to be **unilateral**
--acquired SO palsy is much more likely to be **bilateral**

What is the most common cause of acquired SO palsy?
Closed head trauma

---

2° to oblique dysfunction

- Superior Oblique (SO)
- Inferior Oblique

- Overaction
- Palsy
- Brown syndrome
Vertical Deviations

Regarding SO palsy: As a general rule:
--congenital SO palsy is much more likely to be **unilateral**
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What is the most common cause of acquired SO palsy?
Closed head trauma

How can you confirm that a SO palsy is congenital?
1) Family-album biopsy (i.e., check old photos for a longstanding head tilt)
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What is the most common cause of acquired SO palsy?
Closed head trauma

How can you confirm that a SO palsy is congenital?
1) **Family-album biopsy** (i.e., check old photos for a longstanding head tilt)
2) **Palsy**

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Superior Oblique (SO)

2° to oblique dysfunction

---

Inferior Oblique (IO)

Overaction

---

Brown syndrome
Vertical Deviations

Figure 8-11 Congenital left fourth nerve palsy. A, Note the left hypertropia and right head tilt as a child. B, Forty years later, the right head tilt is still present, but the patient describes more difficulty maintaining single, binocular vision. C, After eye muscle surgery, the diplopia and head tilt have resolved. (Courtesy of Lanning B. Kline, MD.)
Vertical Deviations

Regarding SO palsy: As a general rule:
--congenital SO palsy is much more likely to be **unilateral**
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What is the most common cause of acquired SO palsy? Closed head trauma

How can you confirm that a SO palsy is congenital?
1) **Family-album biopsy** (i.e., check old photos for a longstanding head tilt)
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When diagnosing a unilateral SO palsy, what must you be sure to rule out?
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2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique

Overaction

**Palsy**

Brown syndrome
Vertical Deviations

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2° to oblique dysfunction

Superior Oblique (SO)  Inferior Oblique

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Overaction

**Palsy**

Brown syndrome
Vertical Deviations

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How can you confirm that a SO palsy is congenital?
1) Family-album biopsy (i.e., check old photos for a longstanding head tilt)
2) Assess for increased vertical fusional amplitudes

Briefly, to what does the term vertical fusional amplitudes refer?

Not much--2-3 prism diopters or so
A lot—in the 12-15 prism diopter range
Vertical Deviations

Regarding SO palsy: As a general rule:

--congenital SO palsy is much more likely to be **unilateral**
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**What is the most common cause of acquired SO palsy?**
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**Briefly, to what does the term vertical fusional amplitudes refer?**
It refers to the amount of vertical prism a pt can take before fusion breaks down
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Regarding SO palsy: As a general rule:
--congenital SO palsy is much more likely to be unilateral
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Briefly, to what does the term vertical fusional amplitudes refer?
It refers to the amount of vertical prism a pt can take before fusion breaks down

For pts without a history of congenital SO palsy, how much vertical prism can they accept without losing fusion?

Brown syndrome
Vertical Deviations

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That it's not in fact an asymmetric bilateral SO palsy

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Closed head trauma

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Vertical Deviations

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--congenital SO palsy is much more likely to be \textbf{unilateral}
--acquired SO palsy is much more likely to be \textbf{bilateral}

What is the most common cause of acquired SO palsy?
Closed head trauma

How can you confirm that a SO palsy is congenital?
1) \textbf{Family-album biopsy} (i.e., check old photos for a longstanding head tilt)
2) Assess for increased \textbf{vertical fusional amplitudes}

When diagnosing a unilateral SO palsy, what must you be sure to rule out?
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In contrast, how large are normal \textbf{horizontal fusional amplitudes}?
Vertical Deviations

Regarding SO palsy: As a general rule:
- congenital SO palsy is much more likely to be **unilateral**
- acquired SO palsy is much more likely to be **bilateral**

**What is the most common cause of acquired SO palsy?**
Closed head trauma

**How can you confirm that a SO palsy is congenital?**
1) **Family-album biopsy** (i.e., check old photos for a longstanding head tilt)
2) Assess for increased **vertical fusional amplitudes**

**Briefly, to what does the term vertical fusional amplitudes refer?**
It refers to the amount of vertical prism a pt can take before fusion breaks down

**For pts without a history of congenital SO palsy, how much vertical prism can they accept without losing fusion?**
Not much; **2-3 prism diopters or so**

**In contrast, how large are normal horizontal fusional amplitudes?**
Much larger—in the 10-15 prism diopter range
Vertical Deviations

Regarding SO palsy: As a general rule:
--congenital SO palsy is much more likely to be unilateral
--acquired SO palsy is much more likely to be bilateral

What is the most common cause of acquired SO palsy?
Closed head trauma

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For pts without a history of congenital SO palsy, how much vertical prism can they accept without losing fusion?
Not much; 2-3 prism diopters or so

How much vertical prism can pts with a congenital SO palsy take without losing fusion?
Vertical Deviations

Regarding SO palsy: As a general rule:
--congenital SO palsy is much more likely to be **unilateral**
--acquired SO palsy is much more likely to be **bilateral**

What is the most common cause of acquired SO palsy?
Closed head trauma

How can you confirm that a SO palsy is congenital?
1) **Family-album biopsy** (i.e., check old photos for a longstanding head tilt)
2) Assess for increased **vertical fusional amplitudes**

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That it’s not in fact an asymmetric bilateral SO palsy

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It refers to the amount of vertical prism a pt can take before fusion breaks down

For pts without a history of congenital SO palsy, how much vertical prism can they accept without losing fusion?
Not much; 2-3 prism diopters or so

How much vertical prism can pts with a congenital SO palsy take without losing fusion?
A **lot** more—in the **# to #** prism diopter range
Regarding SO palsy: As a general rule:
--congenital SO palsy is much more likely to be **unilateral**
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What is the most common cause of acquired SO palsy?
Closed head trauma

How can you confirm that a SO palsy is congenital?
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That it's not in fact an asymmetric bilateral SO palsy

Briefly, to what does the term **vertical fusional amplitudes** refer?
It refers to the amount of vertical prism a pt can take before fusion breaks down

For pts without a history of congenital SO palsy, how much vertical prism can they accept without losing fusion?
Not much; 2-3 prism diopters or so

How much vertical prism can pts with a congenital SO palsy take without losing fusion?
A **lot** more—in the 12-15 prism diopter range
Vertical Deviations

Regarding SO palsy: As a general rule:
-- congenital SO palsy is much more likely to be **unilateral**
-- acquired SO palsy is much more likely to be **bilateral**

What is the most common cause of acquired SO palsy? Closed head trauma

How can you confirm that a SO palsy is congenital?
1) **Family-album biopsy** (i.e., check old photos for a longstanding head tilt)
2) Assess for increased **vertical fusional amplitudes**

When diagnosing a unilateral SO palsy, what must you be sure to rule out?

---

- Overaction
- **Palsy**
- Brown syndrome
Regarding SO palsy: As a general rule:
- congenital SO palsy is much more likely to be **unilateral**
- acquired SO palsy is much more likely to be **bilateral**

What is the most common cause of acquired SO palsy?
Closed head trauma

How can you confirm that a SO palsy is congenital?
1) **Family-album biopsy** (i.e., check old photos for a longstanding head tilt)
2) Assess for increased **vertical fusional amplitudes**

When diagnosing a unilateral SO palsy, what must you be sure to rule out?
That it’s not in fact an asymmetric bilateral SO palsy
**Vertical Deviations**

2° to oblique dysfunction

- Superior Oblique (SO)
- Inferior Oblique

**Palsy**

- Overaction
- Brown syndrome

---

**Regarding SO palsy: As a general rule:**
-- congenital SO palsy is much more likely to be **unilateral**
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**What is the most common cause of acquired SO palsy?**
Closed head trauma

**How can you confirm that a SO palsy is congenital?**
1) **Family-album biopsy** (i.e., check old photos for a longstanding head tilt)
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**When diagnosing a unilateral SO palsy, what must you be sure to rule out?**
**That it’s not in fact an asymmetric bilateral SO palsy**

**Why should you care whether a palsy is unilateral vs bilateral?**
Vertical Deviations

Regarding SO palsy: As a general rule:
- congenital SO palsy is much more likely to be unilateral
- acquired SO palsy is much more likely to be bilateral

What is the most common cause of acquired SO palsy?
Closed head trauma

How can you confirm that a SO palsy is congenital?
1) Family-album biopsy (i.e., check old photos for a longstanding head tilt)
2) Assess for increased vertical fusional amplitudes

When diagnosing a unilateral SO palsy, what must you be sure to rule out?
That it’s not in fact an asymmetric bilateral SO palsy

Why should you care whether a palsy is unilateral vs bilateral?
All bilateral SO palsies should be assumed to be acquired. Thus, absent an appropriate head-trauma hx, a bilateral SO palsy represents an ongoing intracranial dz process until proven otherwise. For this reason, it is absolutely vital that one establish with certainty the uni- vs bilaterality of SO palsy!
Vertical Deviations

Regarding SO palsy: As a general rule:
--congenital SO palsy is much more likely to be **unilateral**
--acquired SO palsy is much more likely to be **bilateral**

**What is the most common cause of acquired SO palsy?**
Closed head trauma

**How can you confirm that a SO palsy is congenital?**
1) **Family-album biopsy** (i.e., check old photos for a longstanding head tilt)
2) Assess for increased **vertical fusional amplitudes**

When diagnosing a unilateral SO palsy, what must you be sure to rule out?
**That it’s not in fact an asymmetric bilateral SO palsy**

If a bilateral SO play pt lacks an appropriate trauma hx, **what should you do?**

All I Thu palpably noted was divergent vertical eye movements within diverse proven otherwise. For this reason, it is absolutely vital that one establish with certainty the uni- vs bilaterality of SO palsy!
Vertical Deviations

Regarding SO palsy: As a general rule:
-- congenital SO palsy is much more likely to be **unilateral**
-- acquired SO palsy is much more likely to be **bilateral**

What is the most common cause of acquired SO palsy?
Closed head trauma

How can you confirm that a SO palsy is congenital?
1) **Family-album biopsy** (i.e., check old photos for a longstanding head tilt)
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When diagnosing a unilateral SO palsy, what must you be sure to rule out?
**That it’s not in fact an asymmetric bilateral SO palsy**

If a bilateral SO play pt lacks an appropriate trauma hx, what should you do?
Image them

If a bilateral SO play pt lacks an appropriate trauma hx, what should you do?
Image them
Vertical Deviations

Regarding SO palsy: As a general rule:
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**What is the most common cause of acquired SO palsy?**
Closed head trauma

How can you confirm that a SO palsy is congenital?
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When diagnosing a unilateral SO palsy, what must you be sure to rule out?
That it’s not in fact an asymmetric bilateral SO palsy

If a bilateral SO play pt lacks an appropriate trauma hx, what should you do?
Image them

What findings differentiate a uni- from a bilateral SO palsy?
establish with certainty the uni- vs bilaterality of SO palsy!
Vertical Deviations

Regarding SO palsy: As a general rule:
--congenital SO palsy is much more likely to be unilateral
--acquired SO palsy is much more likely to be bilateral

What is the most common cause of acquired SO palsy?
Closed head trauma

How can you confirm that a SO palsy is congenital?
1) Family-album biopsy (i.e., check old photos for a longstanding head tilt)
2) Check vertical fusional amplitudes (normal ~ 2Δ; can be as much as 10Δ)

When diagnosing a unilateral SO palsy, what must you rule out?
That it’s not in fact an asymmetric bilateral SO palsy (V-pattern ET present?)

Key Findings in Uni- vs Bilateral SO Palsy

<table>
<thead>
<tr>
<th>V-pattern ET present?</th>
<th>Unilateral SO palsy</th>
<th>Bilateral SO palsy</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes or no</td>
<td>yes</td>
<td>yes or no</td>
</tr>
</tbody>
</table>

Superior Oblique (SO)
Inferior Oblique

Overaction
Brown syndrome

60 Brown syndrome
Vertical Deviations

Regarding SO palsy: As a general rule:
--congenital SO palsy is much more likely to be unilateral
--acquired SO palsy is much more likely to be bilateral

What is the most common cause of acquired SO palsy?
- Closed head trauma

How can you confirm that a SO palsy is congenital?
1) Family-album biopsy (i.e., check old photos for a longstanding head tilt)
2) Check vertical fusional amplitudes (normal ~ 2△; can be as high as 12-15△ in congenital SO palsy)

When diagnosing a unilateral SO palsy, what must you be sure to rule out?

V-pattern ET present?

Unilateral SO palsy

No

Bilateral SO palsy

Yes

Key Findings in Uni- vs Bilateral SO Palsy
### Vertical Deviations

**Regarding SO palsy:** As a general rule:
- Congenital SO palsy is much more likely to be **unilateral**
- Acquired SO palsy is much more likely to be **bilateral**

*What is the most common cause of acquired SO palsy?*  
Closed head trauma

*How can you confirm that a SO palsy is congenital?*
1. **Family-album biopsy** (i.e., check old photos for a longstanding head tilt)
2. Check **vertical fusional amplitudes**
   - Normal ~ 2°; can be as high as 12-15° in congenital SO palsy

*When diagnosing a unilateral SO palsy, what V-pattern ET present?*
- **Head-tilt test?**  
  - Unilateral SO palsy: No  
  - Bilateral SO palsy: Yes

*How much excyclotorsion on double Maddox rod testing?*  
- Positive to one side only
  - Unilateral SO palsy: Less than 10°
  - Bilateral SO palsy: May be more than 10°

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### Key Findings in Uni- vs Bilateral SO Palsy

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Regarding SO palsy: As a general rule:
-- congenital SO palsy is much more likely to be unilateral
-- acquired SO palsy is much more likely to be bilateral

What is the most common cause of acquired SO palsy?
Closed head trauma

How can you confirm that a SO palsy is congenital?
1) Family-album biopsy (i.e., check old photos for a longstanding head tilt)
2) Check vertical fusional amplitudes (normal ~ 2°; can be as high as 12-15° in congenital SO palsy)

When diagnosing a unilateral SO palsy, what V-pattern ET present?
Head-tilt test?
Unilateral SO palsy: No
Always less than 10°
Positive to one side only
Bilateral SO palsy: Yes
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Key Findings in Uni- vs Bilateral SO Palsy

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What is double Maddox rod testing? I'm glad you asked…
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A translucent disc of red plastic constructed of a set of very small cylinders aligned parallel to one another.

What does a pt see when shown a point-source of light through a Maddox rod?

The point of light is seen as a line oriented 90° from the orientation of the cylinders.

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How can double-Maddox rods be used to measure the amount of cyclotorsion?

The Maddox-rod lenses can be mounted in trial frames that allow the orientation of the cylinders to be changed, and the pt is instructed to do so until s/he perceives the lines to be parallel. The difference in degrees between the orientation of the two sets of cylinders is the size of the excyclotorsion.
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Sometimes a clear Maddox rod is used for one eye

Double Maddox rod setup
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Double Maddox rod test in individual without strabismus
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Double Maddox rod test in individual with a right SO palsy
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How can the size of the excyclotorsion be used to differentiate between unilateral and bilateral SO palsies?
**Vertical Deviations**

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The maximum amount of excyclotorsion that can result from unilateral SO palsy is 10 deg. Thus, if the excyclotorsion is greater than 10 degrees, bilateral palsies must be present. This means that if less than 10 deg is present, the palsy must be unilateral, right?
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The maximum amount of excyclotorsion that can result from unilateral SO palsy is 10 deg. This means that if less than 10 deg is present, the palsy must be unilateral, right? Slow ya roll. It’s true that if only one eye is excyclotorted, the total measured excyclotorsion is always 10 deg or less. However, if both eyes are only mildly palsied—say, 4 degree’s worth each—the total excyclotorsion (in this case 8 deg) could be less than 10. Thus, whereas >10 deg rules out unilateral SO palsy, <10 does not rule it in.
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This means that if less than 10 deg is present, the palsy must be unilateral, right?  
Slow ya roll. It’s true that if only one eye is excyclotorted, the total measured excyclotorsion is always 10 deg or less. However, if both eyes are only mildly palsied—say, 4 degree’s worth each—the total excyclotorsion (in this case 8 deg) could be less. Thus, whereas >10 deg rules out unilateral SO palsy, <10 does not rule it in.

All that said, it is very unusual for a bilateral SO palsy to present with less than 5 deg of torsion. <10 does not rule it in.
**Vertical Deviations**

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TLDR  
>10 excyclotorsion is always bilateral  
<5 (but greater than 0, duh) is almost always unilateral  
5-10 is indeterminate
Vertical Deviations

Regarding SO palsy: As a general rule:
--congenital SO palsy is much more likely to be unilateral
--acquired SO palsy is much more likely to be bilateral

What is the most common cause of acquired SO palsy?

Closed head trauma

How can you confirm that a SO palsy is congenital?

1) Family-album biopsy (i.e., check old photos for a longstanding head tilt)
2) Check vertical fusional amplitudes (normal ~ 2Δ; can be as high as 12-15Δ in congenital SO palsy)

When diagnosing a unilateral SO palsy, V-pattern ET present?

No

Always less than 10°

Positive to one side only

Head-tilt test?

Bilateral SO palsy

Yes

May be more than 10°

Positive to both sides

Key Findings in Uni- vs Bilateral SO Palsy

unilateral

bilateral

Brown syndrome
Vertical Deviations

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When diagnosing a unilateral SO palsy, what V-pattern ET present?

Unilateral SO palsy: No
Bilateral SO palsy: Yes

How much excyclotorsion on double Maddox rod testing?
Unilateral SO palsy: Always less than 10°
Bilateral SO palsy: May be more than 10°

Head-tilt test?
Unilateral SO palsy: Positive to one side only
Bilateral SO palsy: Positive to both sides

Key Findings in Uni- vs Bilateral SO Palsy

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Brown syndrome

Superior Oblique (SO)
Inferior Oblique

Overaction

Palsy

2° to oblique dysfunction
Vertical Deviations

Regarding SO palsy: As a general rule:
--congenital SO palsy is much more likely to be **unilateral**
--acquired SO palsy is much more likely to be **bilateral**

What is the most common cause of acquired SO palsy?

**Key Findings in Uni- vs Bilateral SO Palsy**

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What is the *head-tilt test*? I’m glad you asked…
Vertical Deviations

The head-tilt test is also known by what eponymous name?

The head-tilt test is actually a single component of what double-eponymous 3-step test?

The Parks-Bielschowsky 3-step test

Generally speaking, what is the purpose/goal of the Parks-Bielschowsky 3-step test?

To identify the cyclovertical muscle responsible for a vertical deviation

How is the head-tilt test performed?

The pt is told to tilt their head first to one side, then to the other, while you observe their eyes. A SO palsy is present if the eye on the side toward which the head is tilted responds to the tilt by drifting up (ie, by becoming hypertropic).
The head-tilt test is also known by what eponymous name? The Beilschowsky head-tilt test
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Generally speaking, what is the purpose/goal of the Parks-Bielschowsky 3-step test? To identify the cyclovertical muscle responsible for a vertical deviation*

*Note: The Parks-Bielschowsky test works if and only if weakness of a single muscle is responsible for the vertical deviation in question!
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Vertical Deviations

Left SO palsy: Positive head tilt test
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The Beilschowsky head-tilt test

The head-tilt test is actually a single component of what double-eponymous 3-step test?
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Why does a head-tilt cause an SO palsy eye to become hypertropic?

It has to do with a ‘righting reflex’ in the ocular control system. When the head is tilted to one side, the eyes attempt to remain level (= superior poles pointing toward the ceiling) by counter-torting in the other direction. So for example, when the head is tilted to the right, to stay upright the right eye will\textsuperscript{\textit{in- vs excyclotort}} (ie, the superior pole will tort \textit{toward vs away from} the midline), while the left eye will\textsuperscript{\textit{in- vs excyclotort}} (ie, the superior pole will tort \textit{toward vs away from} the midline).

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**Vertical Deviations**

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Recall that the intorters of the eye are the superior rectus and the superior oblique (you can remember this with the mnemonic SIN, which stands for Superiors Intort). Thus, when an eye attempts to intort, both the SR and the SO fire. Note that the SR and the SO also have equal-but-opposite vertical components to their actions—the SR elevates the eye, while the SO depresses it. So when both muscles fire simultaneously, their vertical components cancel each other out, and the eye simply intorts. Now consider what happens upon head tilt if the eye on that side has a SO palsy. Attempted intorsion results in contraction of the SR only (because the palsied SO cannot contract). Thus, the vertical component of the SR contraction is unopposed, and because it is unopposed, the eye elevates. This is why an eye with a SO palsy demonstrates a hypertropia upon head tilt to that side!
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**Vertical Deviations**

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Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Uncertain mechanism

Management of unilateral SO palsy:
--If no IO overaction is present: [surgery]
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)  Inferior Oblique (IO)

Uncertain mechanism

Management of unilateral SO palsy:
--If no IO overaction is present: Contralateral IR recession
Vertical Deviations

2º to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Uncertain mechanism

Management of unilateral SO palsy:
--If no IO overaction is present: **Contralateral IR recession**

**Wha? Why perform contralateral IR recession for unilateral SO palsy?**
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Uncertain mechanism

Inferior Oblique (IO)

Management of unilateral SO palsy:
--If no IO overaction is present: Contralateral IR recession

Wha? Why perform contralateral IR recession for unilateral SO palsy?
Patients with an SO palsy c/o diplopia in downgaze. This is because the unaffected eye can depress fully, but the eye with the SO palsy cannot. The contralateral IR is the yoke muscle for the palsied SO. By recessing the contralateral IR, you inhibit that eye’s ability to depress, thereby eliminating the source of diplopia (i.e., the asymmetry in depression).
Vertical Deviations

2° to oblique dysfunction

Uncertain mechanism

Superior Oblique (SO)

Inferior Oblique (IO)

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In essence, you treat a unilateral motility problem by giving the patient a bilateral motility problem.
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Uncertain mechanism

Management of unilateral SO palsy:
--If no IO overaction is present: **Contralateral IR recession**
--If IO overaction is present, but deviation is <15°: [surgery]
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Palsy

Brown syndrome

Inferior Oblique (IO)

Overaction

Uncertain mechanism

Management of unilateral SO palsy:
--If no IO overaction is present: **Contralateral IR recession**
--If IO overaction is present, but deviation is <15Δ:
  **IO weakening procedure**
**Vertical Deviations**

2° to oblique dysfunction

- **Superior Oblique (SO)**
- **Inferior Oblique (IO)**

Uncertain mechanism

Management of **unilateral** SO palsy:

--If no IO overaction is present: **Contralateral IR recession**

--If IO overaction is present, but deviation is <15Δ:
  - **IO weakening procedure**

--If IO overaction is present and the deviation is >15Δ: [surgery]
Vertical Deviations

2° to oblique dysfunction

Uncertain mechanism

Superior Oblique (SO)

Inferior Oblique (IO)

Overaction

Palsy

Brown syndrome

Management of unilateral SO palsy:
--If no IO overaction is present: **Contralateral IR recession**
--If IO overaction is present, but deviation is <15Δ: **IO weakening procedure**
--If IO overaction is present and the deviation is >15Δ: **Perform both**
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Uncertain mechanism

Management of unilateral SO palsy:
--If no IO overaction is present: **Contralateral IR recession**
--If IO overaction is present, but deviation is <15Δ:
  IO weakening procedure
--If IO overaction is present and the deviation is >15Δ: **Perform both**

Management of bilateral SO palsy:
--If main c/o is torsional diplopia: **[surgery]**
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Uncertain mechanism

Inferior Oblique (IO)

Overaction

Palsy

Brown syndrome

Management of unilateral SO palsy:
--If no IO overaction is present: Contralateral IR recession
--If IO overaction is present, but deviation is <15Δ:
  IO weakening procedure
--If IO overaction is present and the deviation is >15Δ:
  Perform both

Management of bilateral SO palsy:
--If main c/o is torsional diplopia: Harada-Ito procedure
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Brown syndrome

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Management of unilateral SO palsy:

-- If no IO overaction is present: Contralateral IR recession
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Management of bilateral SO palsy:

-- If main c/o is torsional diplopia:

Briefly, what is the Harada-Ito procedure?

Harada-Ito procedure
**Brown Syndrome**

**Vertical Deviations**

2° to oblique dysfunction

Superior Oblique (SO)  Inferior Oblique (IO)

**Palsy**

- Overaction
- Brown syndrome

**Management of unilateral SO palsy:**
- If no IO overaction is present: Contralateral IR recession
- If IO overaction is present, but deviation is <15°: IO weakening procedure
- If IO overaction is present and the deviation is >15°: Perform both

**Management of bilateral SO palsy:**
- If main c/o is torsional diplopia:

**Briefly, what is the Harada-Ito procedure?**
Both SO tendons are split, and the anterior portion of each is repositioned and performed.

**Harada-Ito procedure**
Vertical Deviations

2° to oblique dysfunction

Uncertain mechanism

Superior Oblique (SO)

Inferior Oblique (IO)

Brown syndrome

Overaction

Palsy

Management of unilateral SO palsy:

--If no IO overaction is present: Contralateral IR recession
--If IO overaction is present, but deviation is <15°:
  IO weakening procedure
--If IO overaction is present and the deviation is >15°:
  Perform both

Management of bilateral SO palsy:

--If main c/o is torsional diplopia:  

Briefly, what is the Harada-Ito procedure?
Both SO tendons are split, and the anterior portion of each is repositioned anteriorly and temporally.

Harada-Ito procedure
Vertical Deviations

Harada-Ito procedure
Define Brown syndrome:

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique

Overaction

Palsy

Brown syndrome

Brown syndrome is a condition characterized by deficient elevation in adduction due to restriction of the SO tendon at the trochlea. It is more commonly observed in males than females, affecting the OD or OS eye. One common strabismus syndrome that has the opposite pattern, occurring more frequently in females and left eyes, is Duane syndrome.

Common causes of SO restriction include:
- Idiopathic
- Traumatic
- Inflammatory
Vertical Deviations

Define **Brown syndrome**:
Deficient elevation in adduction 2° to restriction of the SO tendon at the trochlea.

2° to oblique dysfunction

- Superior Oblique (SO)
- Inferior Oblique

- Overaction
- Palsy

**Brown syndrome**
Vertical Deviations

Right Brown syndrome
Define Brown syndrome:
Deficient elevation in adduction 2° to restriction of the SO tendon at the trochlea

Is Brown syndrome more common in…
…males or females?
…OD or OS?

Brown syndrome

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Overaction

Palsy
Define **Brown syndrome**: Deficient elevation in adduction 2° to restriction of the SO tendon at the trochlea

*Is Brown syndrome more common in…*  
…males or females? **Males**  
…OD or OS? **OD**
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique

Define Brown syndrome: Deficient elevation in adduction 2° to restriction of the SO tendon at the trochlea

Is Brown syndrome more common in…
…males or females? Males
…OD or OS? OD

What common strabismus syndrome has the opposite pattern (i.e., is more common in females and left eyes)?

Brown syndrome
Define **Brown syndrome**: Deficient elevation in adduction 2° to restriction of the SO tendon at the trochlea.

Is **Brown syndrome** more common in…
...males or females? **Males**
...OD or OS? **OD**

What common strabismus syndrome has the opposite pattern (i.e., is more common in **females** and **left** eyes)? **Duane syndrome**
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Is Brown syndrome more common in…
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Duane syndrome

Name three causes of SO restriction at the trochlea:
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Define Brown syndrome: Deficient elevation in adduction 2° to restriction of the SO tendon at the trochlea.

Is Brown syndrome more common in... males or females? **Males**
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Name three causes of SO restriction at the trochlea:
--Idiopathic/congenital (ie, born with a short tendon)
--Traumatic
--Inflammatory
Define **Brown syndrome**: Deficient elevation in adduction 2° to restriction of the SO tendon at the trochlea

*Is Brown syndrome more common in… males or females? Males… OD or OS? OD*

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*Name three causes of SO restriction at the trochlea:*
  -- Idiopathic/congenital (ie, born with a short tendon)
  -- Traumatic
  -- Inflammatory

*In addition to restricted elevation, what else occurs during adduction in Brown syndrome?*
  --
Vertical Deviations

Define **Brown syndrome**: Deficient elevation in adduction 2° to restriction of the SO tendon at the trochlea.

Is Brown syndrome more common in…
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In addition to restricted elevation, what else occurs during adduction in Brown syndrome?
--The palpebral fissure widens
--The eye may involuntarily depress (called **downshoot**)

2° to oblique dysfunction

Superior Oblique (SO)  Inferior Oblique

--- Overaction
--- Palsy

**Brown syndrome**
Define Brown syndrome:
Deficient elevation in adduction 2° to restriction of the SO tendon at the trochlea

Is Brown syndrome more common in...
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What common strabismus syndrome has the opposite pattern (i.e., is more common in females and left eyes)?

Duane syndrome

Briefly, what is Duane syndrome?

- A motility disorder with the following key findings:
  - At least some limitation of horizontal movement
  - Attempted adduction causes the globe to retract, and may cause it to up- or downshoot

What is the cause?
The nucleus for cranial nerve VI is missing, and the lateral rectus is innervated by cranial nerve III.

In addition to restricted elevation, what else occurs during adduction in Brown syndrome?
- The palpebral fissure widens
- The eye may involuntarily depress (called downshoot)
Vertical Deviations

Define Brown syndrome:
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-- At least some limitation of horizontal movement
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**Inferior Oblique (IO)**

**Brown syndrome**

Deficient elevation in adduction 2° to restriction of the SO tendon at the trochlea.

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-- Attempted adduction causes the globe to retract, and may cause it to up- or downshoot

What is the cause?

The eye may involuntarily express (called downshoot)

Define Brown syndrome:

Deficient elevation in adduction 2° to restriction of the SO tendon at the trochlea.

Brown syndrome is caused by:

-- Idiopathic/congenital (i.e., born with a short tendon)
-- Traumatic
-- Inflammatory

In addition to restricted elevation, what else occurs during adduction in Brown syndrome?

-- The palpebral fissure widens
-- The eye may involuntarily express (called downshoot)
Define Brown syndrome:
Deficient elevation in adduction 2º to restriction of the SO tendon at the trochlea

Is Brown syndrome more common in...
...males or females? Males
...OD or OS? OD

What common strabismus syndrome has the opposite pattern (i.e., is more common in females and left eyes)?

Duane syndrome

Briefly, what is Duane syndrome?
A motility disorder with the following key findings:
--At least some limitation of horizontal movement
--Attempted adduction causes the globe to retract, and may cause it to up- or downshoot

What is the cause?
The nucleus for cranial nerve # is missing, and the lateral rectus is innervated by cranial nerve #
Vertical Deviations

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How does this…

...cause this?
Vertical Deviations

When someone with an intact oculomotor system adducts their eye, innervation is increased to the medial rectus (as it should be) and decreased to the lateral rectus (also as it should be).

(No question—continue when ready)

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When someone with an intact oculomotor system adducts their eye, innervation is increased to the medial rectus (as it should be) and decreased to the lateral rectus (also as it should be). However, in a Duane’s pt CN3 innervates the LR, so when she attempts to adduct her eye, innervation is increased to both the medial rectus and the aberrantly-innervated lateral rectus, so the eye doesn’t adduct.

(No question—continue when ready)

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(No question—continue when ready)

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--- How does this...?
--- ...cause this?
--- Restriction at the trochlea: congenital or traumatic, which...
Vertical Deviations

When someone with an intact oculomotor system adducts their eye, innervation is increased to the medial rectus (as it should be) and decreased to the lateral rectus (also as it should be). However, in a Duane’s pt CN3 innervates the LR, so when she attempts to adduct her eye, innervation is increased to both the medial rectus and the aberrantly-innervated lateral rectus, so the eye doesn’t adduct. And when two muscles on opposite sides of the eye contract simultaneously, the net result will be that the eye is pulled back, ie, it retracts. Further, if this co-contraction is sufficiently vigorous, one or the other rectus muscle might ‘slip’ upwards or downwards, causing the eye to up- or downshoot respectively.

**Duane syndrome**

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**Duane syndrome**

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How does this...
Define Brown syndrome:
Deficient elevation in adduction 2º to restriction of the SO tendon at the trochlea.

Is Brown syndrome more common in ...males or females? Males ...OD or OS? OD

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1) IR restriction
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What clinical exam finding must be present if one is to make the diagnosis of Brown syndrome?
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Vertical Deviations

2\(^{\circ}\) to oblique dysfunction

Superior

Deficient elevation in adduction

Define Brown syndrome:

Is Brown syndrome more common in...

...males or females? Males

...OD or OS? OD

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1) IR restriction

2) IO palsy
Vertical Deviations

**Brown syndrome**: Deficient elevation in adduction due to restriction of the SO tendon at the trochlea.

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Vertical Deviations

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Vertical Deviations

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2° to restriction of the SO tendon at the trochlea

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Define Brown syndrome: Deficient elevation in adduction

2° to oblique dysfunction

Superior

Is Brown syndrome more common in…
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Infer: What common strabismus syndrome has the opposite pattern (i.e., is more common in females and left eyes)?
Duane syndrome

Name three causes of trochlear restriction:
1) Idiopathic
2) Traumatic
3) Inflammatory

In addition to restricted elevation, what else occurs during adduction in Brown syndrome?
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2) The eye may involuntarily depress (called downshoot)

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Vertical Deviations

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Vertical Deviations

Define Brown syndrome:
Deficient elevation in adduction

2° to oblique dysfunction
Superior

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Vertical Deviations

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Define Brown syndrome: **Deficient elevation in adduction**

2º to oblique dysfunction

- Superior Oblique (SO)
- Inferior Oblique (IO)

Uncertain mechanism

Overaction Palsy

Brown syndrome

Double Elevator Palsy

**DVD**

**Differentiating Brown syndrome from IO palsy**

<table>
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**Males**

**OD or OS? OD**

What common strabismus syndrome has the opposite pattern (i.e., is more common in females and left eyes)?

Duane syndrome

Name three causes of trochlear restriction:

- Idiopathic
- Traumatic
- Inflammatory

In addition to restricted elevation, what else occurs during adduction in Brown syndrome?

- The palpebral fissure widens
- The eye may involuntarily depress (called downshoot)

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**Vertical Deviations**

**Define Brown syndrome:**
- **Deficient elevation in adduction**
- To restriction of the SO tendon at the trochlea

**Is Brown syndrome more common in...**
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**The reverse is true if the globe is anteropulsed (pulled forward) prior to performing forced ductions.**

**Differentiating Brown syndrome from IO palsy**

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Vertical Deviations

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Differentiating Brown syndrome from IO palsy

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Vertical Deviations

Define Brown syndrome: Deficient elevation in adduction

2° to oblique dysfunction

Superior

Deficient elevation in adduction 2° to restriction of the SO tendon at the trochlea

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Differentiating Brown syndrome from IO palsy

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Vertical Deviations

2° to oblique dysfunction

Superior Inferior

Brown syndrome:
- Deficient elevation in adduction
- Tendon restriction at the trochlea

Is Brown syndrome more common in...
- Males or females? Males
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What common strabismus syndrome has the opposite pattern (i.e., is more common in females and left eyes)?
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Name three causes of trochlear restriction:
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Differentiating Brown syndrome from IO palsy

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Differentiating Brown syndrome from IO palsy

Forced ductions? Strabismus pattern? SO overaction?

IO Palsy

Brown Syndrome

What other two causes of trochlear restriction are there?

Who are Brown syndrome more common in males or females?

What common strabismus syndrome has the opposite pattern (i.e., is more common in females and left eyes)?

Name three causes of trochlear restriction:

In addition to restricted elevation, what else occurs during adduction in Brown syndrome?

What other two entities could produce restriction of elevation in adduction?

Differentiating Brown syndrome from IO palsy

Forced ductions? Strabismus pattern? SO overaction?

IO Palsy

Brown Syndrome

What is the clinical exam finding that must be present to make the diagnosis of Brown syndrome?

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Vertical Deviations

Define **Brown syndrome**: Deficient elevation in adduction to restriction of the SO tendon at the trochlea.

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Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Uncertain mechanism

Brown syndrome: Management

-- In acute-onset cases, image... [2 locations]
Brown syndrome: Management

-- In acute-onset cases, image sinuses & orbits

-- Consider steroids (systemic and/or local)

-- If present, treat systemic inflammatory disease

-- Consider surgery only if hypotropic in primary gaze

Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

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Brown syndrome: Management

-- In acute-onset cases, image sinuses & orbits

Overaction

Palsy

Brown syndrome
Vertical Deviations

Axial STIR (A) and postcontrast fat-saturated T1 (B) images; coronal STIR (C) and postcontrast fat-saturated T1 (D) images. There is subtle increased STIR signal and mild asymmetric thickening in anterior portion of the left superior oblique tendon. On postcontrast imaging, there is prominent enhancement around the trochlea region (B and D, indicated by the arrows).

Acute Brown syndrome
Brown syndrome: **Management**

--In acute-onset cases, image sinuses & orbits
--Consider [drug]

2° to oblique dysfunction

Uncertain mechanism

Superior Oblique (SO)

--Overaction

--Palsy

**Brown syndrome**

Inferior Oblique (IO)
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)
- Overaction
- Palsy
- Brown syndrome

Inferior Oblique (IO)

Uncertain mechanism

Brown syndrome: Management
-- In acute-onset cases, image... sinuses & orbits
-- Consider... steroids (systemic and/or local)
**Brown syndrome:** *Management*

-- In acute-onset cases, image... sinuses & orbits
-- Consider... steroids (systemic and/or local)
-- If present, treat...
Brown syndrome: 

**Management** 

-- In acute-onset cases, image sinuses & orbits 
-- Consider steroids (systemic and/or local) 
-- If present, treat systemic inflammatory disease 

*Vertical Deviations*

2° to oblique dysfunction

- Superior Oblique (SO)
- Inferior Oblique (IO)
  - Overaction
  - Palsy
  - **Brown syndrome**
Vertical Deviations

2° to oblique dysfunction

- Superior Oblique (SO)
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- Inferior Oblique (IO)

Uncertain mechanism

Brown syndrome: Management

-- In acute-onset cases, image... sinuses & orbits
-- Consider... steroids (systemic and/or local)
-- If present, treat... systemic inflammatory disease
-- Consider surgery only if... [specific strabismic problem]
Vertical Deviations

1. Brown syndrome: Management
   - In acute-onset cases, image sinuses & orbits
   - Consider steroids (systemic and/or local)
   - If present, treat systemic inflammatory disease
   - Consider surgery only if hypotropia is present in primary gaze

2. 2° to oblique dysfunction
   - Superior Oblique (SO)
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3. Uncertain mechanism
   - Overaction
   - Palsy
   - Brown syndrome

Brown syndrome: Management
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Vertical Deviations

Vertical Deviations

$2^\circ$ to oblique dysfunction

Superior Oblique (SO)
- Overaction
- Palsy
- Brown syndrome

Inferior Oblique (IO)
- ?

Uncertain mechanism
Vertical Deviations

2° to oblique dysfunction

- Superior Oblique (SO)
  - Overaction
  - Palsy
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- Inferior Oblique (IO)
  - Overaction
  - Palsy

Uncertain mechanism
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)
- Overaction
- Palsy
- Brown syndrome

Inferior Oblique (IO)
- Overaction
- Palsy

IO Overaction
--Eye elevates in…[position]

Uncertain mechanism
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)
- Overaction
- Palsy
- Brown syndrome

Inferior Oblique (IO)
- Overaction

IO Overaction
--Eye elevates in...adduction

Uncertain mechanism
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)
- Overaction
- Palsy
- Brown syndrome

Inferior Oblique (IO)
- Overaction
- Palsy

IO Overaction
--Eye elevates in adduction
--Develops in % of congenital ET cases

Uncertain mechanism
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)
- Overaction
- Palsy
- Brown syndrome

Inferior Oblique (IO)
- Overaction
- Palsy

IO Overaction
- Eye elevates in adduction
- Develops in ~2/3 of congenital ET cases

Uncertain mechanism
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)
- Overaction
- Palsy
- Brown syndrome

Inferior Oblique (IO)
- Overaction
- Palsy

IO Palsy
[How common?]

Uncertain mechanism
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)
- Overaction
- Palsy
- Brown syndrome

Inferior Oblique (IO)
- Overaction
- Palsy

IO Palsy
-- Uncommon

Uncertain mechanism
Vertical Deviations

2° to oblique dysfunction

- Superior Oblique (SO)
  - Overaction
  - Palsy
  - Brown syndrome

- Inferior Oblique (IO)
  - Overaction
  - Palsy

Uncertain mechanism

**IO Palsy**
- Uncommon
- Etiology uncertain
Vertical Deviations

2° to oblique dysfunction

- Superior Oblique (SO)
  - Overaction
  - Palsy
  - Brown syndrome

- Inferior Oblique (IO)
  - Overaction
  - Palsy

IO Palsy
- Uncommon
- Etiology uncertain
- Clinically similar to... strabismic entity

Uncertain mechanism
Vertical Deviations

- 2º to oblique dysfunction
  - Superior Oblique (SO)
    - Overaction
    - Palsy
    - Brown syndrome
  - Inferior Oblique (IO)
    - Overaction
    - Palsy

- Uncertain mechanism

**IO Palsy**
- Uncommon
- Etiology uncertain
- Clinically similar to... SO overaction
  (can be a difficult differentiation)
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)
  - Overaction
  - Palsy
  - Brown syndrome

Inferior Oblique (IO)
  - Overaction
  - Palsy

Uncertain mechanism

?  ?
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)
- Overaction
- Palsy
- Brown syndrome

Inferior Oblique (IO)
- Overaction
- Palsy

Uncertain mechanism

Double Elevator Palsy

DVD
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)  Inferior Oblique (IO)

Overaction  Overaction

Uncertain mechanism

Double Elevator Palsy

DVD

Double Elevator Palsy

--aka…
Vertical Deviations

2º to oblique dysfunction

- Superior Oblique (SO)
- Inferior Oblique (IO)

Uncertain mechanism

- Overaction
- Double Elevator Palsy
- DVD

**Double Elevator Palsy**
--aka…**Monocular Elevation Deficiency**
Double elevator palsy
Vertical Deviations

2° to oblique dysfunction

- Superior Oblique (SO)
- Inferior Oblique (IO)

Uncertain mechanism

- Double Elevator Palsy
- DVD

Double Elevator Palsy
--aka... Monocular Elevation Deficiency
--Catch-all term for a strabismus involving... [basic problem]
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Uncertain mechanism

Double Elevator Palsy

--aka…Monocular Elevation Deficiency
--Catch-all term for a strabismus involving…decreased elevation in all fields of gaze
--Due to…restriction or elevation insufficiency (or both)--Presents with…hypotropia that worsens in upgaze
--Often adopt a…chin-up position--50% have…concomitant ptosis (1/3 of these with…Marcus-Gunn jaw wink)

DVD
Vertical Deviations

2° to oblique dysfunction

- Superior Oblique (SO)
- Inferior Oblique (IO)

Uncertain mechanism

- Double Elevator Palsy
- DVD

**Double Elevator Palsy**

- *aka*...**Monocular Elevation Deficiency**
- Catch-all term for a strabismus involving...decreased elevation in all fields of gaze
- Due to...*[two explanations]*
Vertical Deviations

2° to oblique dysfunction
- Superior Oblique (SO)
- Inferior Oblique (IO)

Uncertain mechanism
- Double Elevator Palsy
- DVD

**Double Elevator Palsy**
- *aka*... *Monocular Elevation Deficiency*
- Catch-all term for a strabismus involving... decreased elevation in all fields of gaze
- Due to... restriction or elevation insufficiency (or both)
Differentiating between IR restriction and elevator insufficiency as the cause of a double elevator palsy

<table>
<thead>
<tr>
<th>Condition</th>
<th>Forced ductions?</th>
<th>Inferior Restriction</th>
<th>Elevator Insufficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Double Elevator Palsy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DVD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

--Catch all term for a strabismus involving decreased elevation in all fields of gaze
--Due to...restriction or elevation insufficiency (or both)
Vertical Deviations

**Differentiating between IR restriction and elevator insufficiency as the cause of a double elevator palsy**

<table>
<thead>
<tr>
<th>Inferior Restriction</th>
<th>Forced ductions?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Elevator Insufficiency</th>
<th>Forced ductions?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td></td>
</tr>
</tbody>
</table>

---

**Double Elevator Palsy**

---

**Uncertain mechanism**

---

**Forced ductions?**

---

**Force generation?**

---

**Elevation saccades?**

---

**DVD**

---

Catch all term for a strabismus involving decreased elevation in all fields of gaze

--Due to restriction or elevation insufficiency (or both)
### Vertical Deviations

**Uncertain mechanism**

<table>
<thead>
<tr>
<th></th>
<th>Forced ductions?</th>
<th>Force generation?</th>
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</thead>
<tbody>
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<td></td>
</tr>
<tr>
<td>Elevator Insufficiency</td>
<td>Negative</td>
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</tbody>
</table>

*DVD*

---

*Differentiating between IR restriction and elevator insufficiency as the cause of a double elevator palsy*

- **Double Elevator Palsy**
- Catch-all term for a strabismus involving decreased elevation in all fields of gaze
- Due to...restriction or elevation insufficiency (or both)
Vertical Deviations

**Differentiating between IR restriction and elevator insufficiency as the cause of a double elevator palsy**

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<th>Forced ductions?</th>
<th>Force generation?</th>
</tr>
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<td>Inferior Restriction</td>
<td>Positive</td>
<td>Normal</td>
</tr>
<tr>
<td>Elevator Insufficiency</td>
<td>Negative</td>
<td>Reduced</td>
</tr>
</tbody>
</table>

**Double Elevator Palsy**

Uncertain mechanism

**DVD**

---

Catch all term for a strabismus involving decreased elevation in all fields of gaze

--Due to... restriction or elevation insufficiency (or both)
Vertical Deviations

Double Elevator Palsy --aka…Monocular Elevation Deficiency --Catch-all term for a strabismus involving decreased elevation in all fields of gaze --Due to…restriction or elevation insufficiency (or both)

Differentiating between IR restriction and elevator insufficiency as the cause of a double elevator palsy

- Forced ductions?
  - Positive
  - Negative

- Force generation?
  - Normal
  - Reduced

- Elevation saccades?
  - Normal

Uncertain mechanism

DVD
Vertical Deviations

20° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Uncertain mechanism

Overaction Palsy

Brown syndrome

Double Elevator Palsy

--aka… Monocular Elevation Deficiency

--Catch-all term for a strabismus involving decreased elevation in all fields of gaze

--Due to… restriction or elevation insufficiency (or both)

Forced ductions?

Force generation?

Elevation saccades?

Differentiating between IR restriction and elevator insufficiency as the cause of a double elevator palsy

Inferior Restriction

Positive

Normal

Normal

Elevator Insufficiency

Negative

Reduced

Reduced

Double Elevator Palsy

DVD
Vertical Deviations

2° to oblique dysfunction

- Superior Oblique (SO)
- Inferior Oblique (IO)

Uncertain mechanism

- Double Elevator Palsy
- DVD

**Double Elevator Palsy**
--aka…**Monocular Elevation Deficiency**
--Catch-all term for a strabismus involving…decreased elevation in all fields of gaze
--Due to…restriction or elevation insufficiency (or both)
--Presents with…
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Uncertain mechanism

Double Elevator Palsy

--aka...Monocular Elevation Deficiency
--Catch-all term for a strabismus involving...decreased elevation in all fields of gaze
--Due to...restriction or elevation insufficiency (or both)
--Presents with...hypotropia that worsens in upgaze

DVD
**Vertical Deviations**

- **2° to oblique dysfunction**
  - Superior Oblique (SO)
  - Inferior Oblique (IO)
  - Overaction

- **Uncertain mechanism**
  - Double Elevator Palsy
  - DVD

**Double Elevator Palsy**
- *aka* Monocular Elevation Deficiency
- Catch-all term for a strabismus involving decreased elevation in all fields of gaze
- Due to restriction or elevation insufficiency (or both)
- Presents with hypotropia that worsens in upgaze
- Often adopt a [head position]
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Uncertain mechanism

Double Elevator Palsy

--aka…**Monocular Elevation Deficiency**
--Catch-all term for a strabismus involving…decreased elevation in all fields of gaze
--Due to…restriction or elevation insufficiency (or both)
--Presents with…hypotropia that worsens in upgaze
--Often adopt a…chin-up position
**Vertical Deviations**

- **2° to oblique dysfunction**
  - Superior Oblique (SO)
  - Inferior Oblique (IO)
  - Overaction
  - Overaction

- **Uncertain mechanism**
  - Double Elevator Palsy
  - DVD

---

**Double Elevator Palsy**

- *aka* Monocular Elevation Deficiency
- Catch-all term for a strabismus involving decreased elevation in all fields of gaze
- Due to restriction or elevation insufficiency (or both)
- Presents with hypotropia that worsens in upgaze
- Often adopt a chin-up position
- 50% have [another EOM problem]
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Uncertain mechanism

Double Elevator Palsy

-- aka... Monocular Elevation Deficiency
-- Catch-all term for a strabismus involving... decreased elevation in all fields of gaze
-- Due to... restriction or elevation insufficiency (or both)
-- Presents with... hypotropia that worsens in upgaze
-- Often adopt a... chin-up position
-- 50% have... concomitant ptosis (1/3 of these with... [eponymous condition])
**Vertical Deviations**

2º to oblique dysfunction

- Superior Oblique (SO)
- Inferior Oblique (IO)

Uncertain mechanism

- Double Elevator Palsy
- DVD

**Double Elevator Palsy**

-- *aka* ... **Monocular Elevation Deficiency**

-- Catch-all term for a strabismus involving ... decreased elevation in all fields of gaze

-- Due to ... restriction or elevation insufficiency (or both)

-- Presents with ... hypotropia that worsens in upgaze

-- Often adopt a ... chin-up position

-- 50% have ... concomitant ptosis (1/3 of these with ... Marcus-Gunn jaw wink)
Vertical Deviations

Broadly speaking, what sort of disorder is Marcus-Gunn jaw wink (MGJW)?

Double Elevator Palsy
--aka...Monocular Elevation Deficiency
--Catch-all term for a strabismus involving decreased elevation in all fields of gaze
--Due to...restriction or elevation insufficiency (or both)
--Presents with...hypotropia that worsens in upgaze
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--50% have...concomitant ptosis (1/3 of these with...Marcus-Gunn jaw wink)

2° to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Overaction

Overaction

Brown syndrome

Double Elevator Palsy

Marcus-Gunn jaw wink
**Vertical Deviations**

2° to oblique dysfunction

- Superior Oblique (SO)
- Inferior Oblique (IO)

**Overaction**
- Superior Oblique Overaction
- Inferior Oblique Overaction

**Double Elevator Palsy**
- *aka…Monocular Elevation Deficiency*
- Catch-all term for a strabismus involving decreased elevation in all fields of gaze
- Due to restriction or elevation insufficiency (or both)
- Presents with hypotropia that worsens in upgaze
- Often adopt a chin-up position
- 50% have concomitant ptosis (1/3 of these with Marcus-Gunn jaw wink)

**Broadly speaking, what sort of disorder is Marcus-Gunn jaw wink (MGJW)?**

It is one of *synkinesis*
**Vertical Deviations**

- **2° to oblique dysfunction**
  - Superior Oblique (SO)
  - Inferior Oblique (IO)

**Double Elevator Palsy**
- *aka…Monocular Elevation Deficiency*
- Catch-all term for a strabismus involving decreased elevation in all fields of gaze
- Due to restriction or elevation insufficiency (or both)
- Presents with hypotropia that worsens in upgaze
- Often adopt a chin-up position
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**Broadly speaking, what sort of disorder is Marcus-Gunn jaw wink (MGJW)?**
- It is one of synkinesis

**What does synkinesis refer to?**
- The involuntary movement of one body part in response to the voluntary movement of another

**Marcus-Gunn jaw wink**
Vertical Deviations

2º to oblique dysfunction

Superior Oblique (SO) Inferior Oblique (IO)

Overaction Overaction

Double Elevator Palsy
--aka…Monocular Elevation Deficiency
--Catch-all term for a strabismus involving decreased elevation in all fields of gaze
--Due to…restriction or elevation insufficiency (or both)
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Broadly speaking, what sort of disorder is Marcus-Gunn jaw wink (MGJW)? It is one of synkinesis

What does synkinesis refer to? The involuntary movement of one bodypart in response to the voluntary movement of another

Marcus-Gunn jaw wink
Broadly speaking, what sort of disorder is Marcus-Gunn jaw wink (MGJW)?
It is one of synkinesis

What does synkinesis refer to?
The involuntary movement of one bodypart in response to the voluntary movement of another

Is the ptosis of MGJW unilateral, or bilateral?

Double Elevator Palsy
--aka…Monocular Elevation Deficiency
--Catch-all term for a strabismus involving decreased elevation in all fields of gaze
--Due to…restriction or elevation insufficiency (or both)
--Presents with…hypotropia that worsens in upgaze
--Often adopt a…chin-up position
--50% have…concomitant ptosis (1/3 of these with…Marcus-Gunn jaw wink)
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)  Inferior Oblique (IO)

Overaction  Overaction

Double Elevator Palsy
--aka…Monocular Elevation Deficiency
--Catch-all term for a strabismus involving decreased elevation in all fields of gaze
--Due to…restriction or elevation insufficiency (or both)
--Presents with…hypotropia that worsens in upgaze
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Broadly speaking, what sort of disorder is Marcus-Gunn jaw wink (MGJW)?
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What does synkinesis refer to?
The involuntary movement of one bodypart in response to the voluntary movement of another

Is the ptosis of MGJW unilateral, or bilateral?
Unilateral

Marcus-Gunn jaw wink
Vertical Deviations

Broadly speaking, what sort of disorder is Marcus-Gunn jaw wink (MGJW)?
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What does synkinesis refer to?
The involuntary movement of one bodypart in response to the voluntary movement of another

Is the ptosis of MGJW unilateral, or bilateral?
Unilateral

What is the clinical hallmark of MGJW?

Double Elevator Palsy
--aka…Monocular Elevation Deficiency
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The involuntary movement of one body part in response to the voluntary movement of another

Is the ptosis of MGJW unilateral, or bilateral?
Unilateral

What is the clinical hallmark of MGJW?
The ptotic lid elevates in response to voluntary masticatory movements of the jaw

Double Elevator Palsy
--aka…Monocular Elevation Deficiency
--Catch-all term for a strabismus involving decreased elevation in all fields of gaze
--Due to…restriction or elevation insufficiency (or both)
--Presents with…hypotropia that worsens in upgaze
--Often adopt a….chin-up position
--50% have…concomitant ptosis (1/3 of these with…Marcus-Gunn jaw wink)
Vertical Deviations
**Vertical Deviations**

**Double Elevator Palsy**
--aka...Monocular Elevation Deficiency
--Catch-all term for a strabismus involving decreased elevation in all fields of gaze
--Due to...restriction or elevation insufficiency (or both)
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**Broadly speaking, what sort of disorder is Marcus-Gunn jaw wink (MGJW)?**
It is one of **synkinesis**

**What does synkinesis refer to?**
The **involuntary** movement of one bodypart in response to the **voluntary** movement of another

**Is the ptosis of MGJW unilateral, or bilateral?**
Unilateral

**What is the clinical hallmark of MGJW?**
The ptotic lid elevates in response to voluntary masticatory movements of the jaw

**Which jaw movements are involved?**
--Lateral displacement
--Protrusion
--Wide opening
--Clenching
**Vertical Deviations**

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--Clenching

Marcus-Gunn jaw wink

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**Vertical Deviations**

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**What does synkinesis refer to?**
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Unilateral

**What is the clinical hallmark of MGJW?**
The ptotic lid elevates in response to voluntary masticatory movements of the jaw.

**Which jaw movements are involved?**
--Lateral displacement
--Protrusion

**What is the classic story regarding when parents first note their infant has MGJW?**
It is while the infant is nursing.
Vertical Deviations

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Marcus-Gunn jaw wink

2º to oblique dysfunction

Superior Oblique (SO)

Inferior Oblique (IO)

Occlusion

Ocular

Double Elevator Palsy
--aka…Monocular Elevation Deficit
--Catch-all term
--Due to…restriction
--Presents with…hypotropia that worsens in upgaze
--Often adopt a…chin-up position
--50% have…concomitant ptosis (1/3 of these with…Marcus-Gunn jaw wink)
Broadly speaking, what sort of disorder is Marcus-Gunn jaw wink (MGJW)? It is one of synkinesis.

An aside: MGJW is a congenital condition in which a cranial nerve (dys)innervates a cranial muscle. What is the general term for such congenital cranial dysinnervation disorders?

Double Elevator Palsy
--aka...Monocular Elevation Deficit
--Catch-all term
--Due to...restriction
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Vertical Deviations

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It is one of synkinesis.

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They are called ‘congenital cranial dysinnervation disorders’.

Double Elevator Palsy
--aka...Monocular Elevation Deficit
--Catch-all term
--Due to...restriction
--Presents with...hypotropia that worsens in upgaze
--Often adopt a...chin-up position
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It is while the infant is nursing.

An aside: MGJW is a congenital condition in which a cranial nerve (dys)innervates a cranial muscle. What is the general term for such congenital cranial dysinnervation disorders?

They are called ‘congenital cranial dysinnervation disorders’.

Marcus-Gunn jaw wink
**Vertical Deviations**

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An aside: **MGJW is a congenital condition in which a cranial nerve (dys)innervates a cranial muscle. What is the general term for such congenital cranial dysinnervation disorders?**
They are called ‘**congenital cranial dysinnervation disorders**’.

Another congenital cranial dysinnervation disorder involving an ophthalmic movement should readily come to mind—what is it?

**Double Elevator Palsy**
--aka…**Monocular Elevation Deficit**
--Catch-all term
--Due to…restriction
--Presents with…hypotropia that worsens in upgaze
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They are called ‘**congenital cranial dysinnervation disorders**’.

Another congenital cranial dysinnervation disorder involving an ophthalmic movement should readily come to mind—what is it? **Duane syndrome**, as discussed previously.
Vertical Deviations

Broadly speaking, what sort of disorder is Marcus-Gunn jaw wink (MGJW)?

An aside: MGJW is a congenital condition in which a cranial nerve (dys)innervates a cranial muscle. What is the general term for such congenital cranial dysinnervation disorders?

They are called ‘congenital cranial dysinnervation disorders’

Another congenital cranial dysinnervation disorder involving an ophthalmic movement should readily come to mind—what is it?

Duane syndrome, as discussed previously

Briefly, what is Duane syndrome?

A motility disorder with the following key findings:
-- At least some limitation of horizontal movement
-- Attempted adduction causes the globe to retract, and may cause it to up- or downshoot

What is the cause?
The nucleus for cranial nerve VI is missing, and the lateral rectus is innervated by cranial nerve III

1

It is one of synkinesis

The involuntary movement of one bodypart in response to the voluntary movement of another

Is the ptosis of MGJW unilateral, or bilateral?

Unilateral

What is the clinical hallmark of MGJW?
The ptotic lid elevates in response to voluntary masticatory movements of the jaw

Which jaw movements are involved?
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-- Wide opening
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1
If a patient has a double elevator palsy, but Bell’s phenomenon is intact, what can be inferred regarding etiology?
If a patient has a double elevator palsy, but Bell’s phenomenon is intact, what can be inferred regarding etiology?

The ‘palsy’ is probably supranuclear in origin; i.e., a problem with the cortical ‘elevation center’
Vertical Deviations

2° to oblique dysfunction

- Superior Oblique (SO)
  - Overaction
  - Palsy
  - Brown syndrome

- Inferior Oblique (IO)
  - Overaction
  - Palsy

Uncertain mechanism

- Double Elevator Palsy
- DVD

**Double Elevator Palsy: Management**

- If IR restricted:
Vertical Deviations

2° to oblique dysfunction

- Superior Oblique (SO)
  - Overaction
  - Palsy
  - Brown syndrome
- Inferior Oblique (IO)
  - Overaction
  - Palsy

Uncertain mechanism

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*Double Elevator Palsy: Management*

-- If IR restricted: Recess it
Vertical Deviations

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Uncertain mechanism

- Double Elevator Palsy
  - Management:
    - If IR restricted: Recess it
    - If no IR restriction:
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Uncertain mechanism

Double Elevator Palsy

- If IR restricted: Recess it
- If no IR restriction: Knapp procedure
Vertical Deviations

2° to oblique dysfunction

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- Double Elevator Palsy
  - Management
    -- If IR restricted: Recess it
    -- If no IR restriction: Knapp procedure
- DVD

What is the Knapp procedure?
Vertical Deviations

2° to oblique dysfunction

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Uncertain mechanism

- Double Elevator Palsy
  - Management
    - If IR restricted: Recess it
    - If no IR restriction: Knapp procedure

What is the Knapp procedure?
Relocating the LR and MR insertions toward the SR
Vertical Deviations

Knapp procedure
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)
  - Overaction
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Double Elevator Palsy

Double Elevator Palsy: Management
-- If IR restricted: Recess it
-- If no IR restriction: Knapp procedure
-- Be sure to address ptosis if present
Vertical Deviations

2° to oblique dysfunction

Superior Oblique (SO)
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Double Elevator Palsy
- Management
  -- If IR restricted: Recess it
  -- If no IR restriction: Knapp procedure
  -- Be sure to address ptosis if present

Why is it important to address the ptosis concurrently?

DVD
Vertical Deviations

2º to oblique dysfunction
- Superior Oblique (SO)
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- Double Elevator Palsy
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    -- If IR restricted: Recess it
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Why is it important to address the ptosis concurrently? You don’t want to elevate an eye behind a ptotic lid—it could lead to amblyopia.
**Vertical Deviations**

- 2° to oblique dysfunction
  - Superior Oblique (SO)
    - Overaction
    - Palsy
    - Brown syndrome
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**Double Elevator Palsy: Management**
- If IR restricted: Recess it
- If no IR restriction: Knapp procedure
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**Why is it important to address the ptosis concurrently?**
You don’t want to elevate an eye behind a ptotic lid—it could lead to deprivation amblyopia.
Vertical Deviations

2° to oblique dysfunction

Uncertain mechanism

In this context, what does DVD stand for?

DVD
Vertical Deviations

- 2° to oblique dysfunction
- Uncertain mechanism

In this context, what does DVD stand for?
Dissociated vertical deviation
Vertical Deviations

2° to oblique dysfunction

Uncertain mechanism

In this context, what does DVD stand for?
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Who is the typical DVD pt?
In this context, what does DVD stand for? Dissociated vertical deviation

Who is the typical DVD pt?
A child with infantile/congenital ET or XT
Vertical Deviations

2° to oblique dysfunction

Uncertain mechanism

In this context, what does DVD stand for?
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Who is the typical DVD pt?
A child with infantile/congenital ET or XT

What is the classic clinical finding?
Vertical Deviations

2° to oblique dysfunction

Uncertain mechanism

In this context, what does DVD stand for?
Dissociated vertical deviation

Who is the typical DVD pt?
A child with infantile/congenital ET or XT

What is the classic clinical finding?
An eye will slowly elevate and extort, either spontaneously (manifest DVD) or when occluded (latent DVD).
Vertical Deviations

DVD
Vertical Deviations

2° to oblique dysfunction

Uncertain mechanism

In this context, what does DVD stand for?
Dissociated vertical deviation

Who is the typical DVD pt?
A child with infantile/congenital ET or XT

What is the classic clinical finding?
An eye will slowly elevate and extort, either spontaneously (manifest DVD) or when occluded (latent DVD). A crucial finding occurs when the drifting eye reorients downward, and it is this--the fellow eye does not move downward simultaneously (as would normally be the case).
Vertical Deviations

Why would it ‘be the case’ that both eyes would move downward simultaneously?

Eye reorients downward, and it is this—the fellow eye does not move downward simultaneously. (as would normally be the case).
Vertical Deviations

2° to oblique dysfunction

Uncertain mechanism

Why would it ‘be the case’ that both eyes would move downward simultaneously? In order to maintain visual cooperation, eye movements are tightly linked—EOMs on each eye are ‘yoked’ to one another to ensure the eyes move in a coordinated fashion. For example, for rightward gaze the right LR and left MR are yoke muscles. Why would it be the case that both eyes would move downward simultaneously? As noted, in DVD the downward reorientation movement by the drifting eye is not accompanied by a downward movement of the fellow eye. As the muscles that depress the eyes are yoke muscles, this means that DVD represents a violation of Hering’s law.

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How does Hering’s law relate to DVD?

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Another good potential OKAP question, IMO…

DVD represents a violation of Hering’s law.

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Uncertain mechanism

Why would it ‘be the case’ that both eyes would move downward simultaneously? In order to maintain visual cooperation, eye movements are tightly linked—EOMs on each side are yoked to one another. For example, the left lateral rectus (LR) and right medial rectus (MR) are yoke muscles.

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As an aside: Is there such a thing as a dissociated horizontal deviation? A DHD? Indeed there is. There is also a dissociated torsional deviation (DTD).

Together, DVD, DHD, and DTD comprise the dissociated strabismus complex. (All that being said, the only one the Peds book discusses at length is DVD.)
Vertical Deviations

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