A- and V-Pattern Strabismus
Vertical Muscle Surgery

Daniel E Neely, MD
Professor of Ophthalmology
Indiana University School of Medicine
Indianapolis, USA
Advanced Strabismus Surgery

• A- and V-Pattern Strabismus
  – Collapsing the pattern

• Management of Oblique Muscles
  – Inferior Oblique
  – Superior Oblique
27-year-old female

- She came to Japan two years ago and she is working as English teacher.
- She came to our hospital to treat her esotropia.
- Esotropia present since infancy.
- She has never had diplopia.
- No amblyopia: VA 20/15 in each eye.
- No stereopsis: even if prism adaptation.
A-pattern esotropia and bilateral superior oblique overaction +3~+4
Angle of esotropia

SPCT(s-c)
F) $30\Delta ET$ (primary position)

N) $55\Delta ET$ (up gaze)

↑
$35\Delta ET$ (primary position)

↓
sl Xp $5\Delta$ (down gaze)
Inyclotorsion in both eyes
I am planning surgery.

- Bilateral medial rectus recession
- Bilateral superior oblique tenotomy or bilateral posterior tenotomy of superior oblique
My Question is...

• Which one do you choose?
Poll Question #1

In addition to medial rectus recession, how would you approach this patient with A-pattern esotropia?

A. Medial rectus upshift
B. Bilateral superior oblique oblique posterior 7/8 tenotomy
C. Bilateral superior oblique disinsertion
D. Bilateral superior oblique tenotomy
E. Bilateral superior oblique spacer
A- and V-Patterns

• A-Pattern
  – Eyes diverge more than 10 PD from upgaze to downgaze

• V-Pattern
  – Eyes converge more than 15 PD from upgaze to downgaze
    • Some convergence in downgaze is normal
Poll Question #2

When shifting horizontal rectus muscles to collapse a V-pattern, which of the following is TRUE?

A. Shift the lateral rectus muscles down
B. Shift the lateral rectus muscles up
C. Shift the medial rectus muscles up
D. None of the above
Poll Question #2

When shifting horizontal rectus muscles to collapse a V-pattern, which of the following is TRUE?

A. Shift the lateral rectus muscles down
B. Shift the lateral rectus muscles up
C. Shift the medial rectus muscles up
D. None of the above
A- and V- Patterns

• Horizontal rectus muscles may be shifted up or down to compensate for A or V patterns:

“Medials to the apex, laterals to the ‘empty space’”
A- and V-Patterns

• Horizontal Rectus Muscle Shift
  – Simple
  – Effective for smaller patterns
  – Particularly useful in the absence of oblique muscle dysfunction
    • Treatment of A- and V-patterns from oblique muscles is covered in the Complex Strabismus lecture
  – Muscles are shifted up or down 1/2 to 1 tendon width (5-10 mm)
Medial Rectus A-Pattern Shift

Corrects up to 15 PD of A-Pattern
Medial Rectus V-Pattern Shift

Recession alone corrects 10 PD, downshift adds 15 PD more
Vertical shift of horizontal muscles can also correct small vertical deviations:

- 4 mm vertical offset of horizontal recti produces approximately 6 PD of vertical correction. Maximum is 15 PD with a full tendon width shift.
- Move the muscles in the direction you want the eye to go.
Inferior Oblique Over-action

Frequently seen with V-pattern ET and XT
Surgery for “I.O. Over-action”

- Inferior Oblique Recession (+1, +2)
- Inferior Oblique Myectomy (+2, +3, +4)
- Anterior Transposition
  - Only if patient has dissociated vertical deviation (DVD) or is at significant risk to develop
    - Congenital esotropia: 90% develop DVD
- Superior Oblique Tuck
  - If superior oblique is lax on traction testing
Inferior Oblique Recession (10mm) Corrects Mild I.O. Over-action

I.O. is sutured back on: 3mm inferior-to and 2mm lateral-to I.R. insertion
Inferior Oblique Myectomy

Maximal weakening for:

- Large V-patterns
  - Up to 40 PD if done bilaterally

- Ipsilateral Superior Oblique palsy
  - Corrects up to 15 PD of hypertropia
Inferior Oblique Myectomy

Distal end of I.O. is disinserted from the globe
An 8-10mm section of the inferior oblique is isolated and removed
Inferior Oblique Myectomy

Inferior oblique is allowed to retract outside Tenon’s capsule.
Inferior Oblique Anterior Transposition

• Useful for I.O. over-action with Dissociated Vertical Deviation (DVD)
  – Spontaneous, slow drift
    • upward
    • outward
    • excyclotorsion
  – when an eye is occluded or when inattentive.
  – 90% of patients with congenital ET
OS just after occlusion removed

Do not see a corresponding right hypotropia on ALT cover test
Anterior Transposition

• Inferior oblique is reattached adjacent and slightly anterior (0 to +2mm) to the inferior rectus insertion.

• Diminishes:
  – DVD
  – Inferior oblique overaction, V-pattern
Superior Oblique

• May produce large A- and V-patterns
• Over-action
  – A-pattern exotropia
  – Treated with SO tenotomy
• Under-action (SO palsy)
  – Congenital weakness associated with lax or redundant tendons on traction testing
Poll Question #3

When performing tenotomy of the superior oblique, which of the following is TRUE?

A. Cutting the superior oblique tendon closer to the insertion on the globe produces THE MOST weakening effect

B. Cutting the superior oblique tendon closer to the trochlea produces THE MOST weakening effect
Poll Question #3

When performing tenotomy of the superior oblique, which of the following is TRUE?

A. Cutting the superior oblique tendon closer to the insertion on the globe produces THE MOST weakening effect

B. Cutting the superior oblique tendon closer to the trochlea produces THE MOST weakening effect
Superior Oblique Tenotomy

- Cutting or tenotomizing the superior oblique closer to the trochlea produces a greater amount of weakening.
S.O. Posterior 7/8 Tenectomy

Graphic from: Dr Gauree Krishnan Ahalia Foundation Eye Hospital
S.O. Posterior 7/8 Tenectomy

- Anterior fibers have predominately torsional effect.
- By preserving the anterior fibers, can weaken S.O. and collapse A-pattern, without causing excyclotorsion.
Congenital Superior Oblique Oblique Palsy

Bilateral Superior Oblique palsy will give V-pat terns
Congenital Palsies: Lax Superior Oblique Tendon

Normal

Lax Tendon
Adult with Congenital SOP

Lax tendon
Superior Oblique Tuck

- Tightens or strengthens a congenitally lax tendon.
- Tucked with a nonabsorbable suture.
- May correct 40 PD or more of V-pattern.
Superior Oblique Tuck

Do not tuck a normal SO tendon – will give a Brown’s Syndrome
Slanted recessions/resections

Figure 4. V-pattern estropia. A, Treatment of a V-pattern esotropia according to the Bietti method. The superior poles of the medial rectus insertions are slanted back. B, Treatment of a V-pattern esotropia according to the Simonsz/von Graefe method. The inferior poles of the medial rectus insertions are
V-ET treatment Simonsz/vonGraefe method (top) Bietti method (bottom)

Figure 3. A, Mathematically, one can consider a rectus muscle to insert at a point (black dot) at the
Summary

A- and V-pattern strabismus

• Shift horizontal recti up or down for small patterns without oblique muscle dysfunction
• Correct significant oblique muscle dysfunction if present (operate on the obliques)
• Insertion slanting strabismus surgery is controversial for A- and V-patterns ??
27-year-old female

- She came to Japan two years ago and she is working as English teacher.
- She came to our hospital to treat her esotropia.

- Esotropia present since infancy.
- She has never had diplopia.
- No amblyopia: VA 20/15 in each eye.
- No stereopsis: even if prism adaptation.
A-pattern esotropia and bilateral superior oblique overaction +3~+4
Angle of esotropia

SPCT(s-c)
F) 30ΔET (primary position)
N) 55ΔET (up gaze)
  
  35ΔET (primary position)
  
  ↓
  sl Xp 5Δ (down gaze)
Incyclotorsion in both eyes
I am planning surgery.

- Bilateral medial rectus recession
  +
- Bilateral superior oblique tenotomy
  or
  Bilateral posterior tenotomy of superior oblique
My Question is...

• Which one do you choose?
• Bilateral superior oblique tenotomy
  or
  Bilateral posterior tenotomy of superior oblique