

Guidelines for Strabismus Surgery

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Horizontal deviation

Esodeviation (PD)	MR recession (mm)	LR resection (mm)
15	3.0	4.0
20	3.5	5.0
25	4.0	6.0
30	4.5	7.0
35	5.0	8.0
40-45	5.5	9.0
50-55	6.0	
60+	7.0	
cripple	9.5 at least	

Exodeviation (PD)	LR recession (mm)	MR resection (mm)
15	4.0	3.0
20	5.0	4.0
25	6.0	5.0
30	7.0	6.0
35	7.5	6.5
40	8.0	7.0
45	8.5	7.5
50	9.0	8.0
55	9.5	8.5
60	10	9.0
cripple	14 at least	

Note :

As these guidelines, surgical success (including MFS) 85-90%, undercorrection 5%, overcorrection 5%

One muscle surgery is unpredictable.

Surgery for vertical deviations (Alvina Pauline Santiago, Arthur L. Rosenbaum 1999)

Hypertropia (PD)	Operating on hypertropic eye		Operating on hypotropic eye	
	SR recess (mm)	IR resect (mm)	SR resect (mm)	IR recess (mm)
5	3.0			3.0
10	4.0			4.0
15	5.0			5.0
20	6.5		3.0	5.0
25	5.0	5.0	5.0	6.0
30	6.0	5.0	6.0	6.0

DVD(PD)	SR recession (mm)
<10	6.0
10	7.0
15	8.0
20	9.0
25	10.0

Kestenbaum-Anderson Procedure (BCSC p 134 1998-1999)

Procedure	Kestenbaum	40% augmented for 30 deg turn	60% augmented for 45 deg turn
Recess MR	5	7	8
Resect MR	6	8.4	9.6
Recess LR	7	9.8	11.2
Resect LR	8	11.2	12.8
Total surgery	13	18.2	20.8
R + R	5+8 = 6+7	7+11.2 = 8.4+9.8	8+12.8 = 9.6+11.2

Summary

Vertical Deviation

- Tight vertical rectus recession 1 mm gives ~ 5 PD
- Nontight vertical rectus recession 1 mm with antagonist resection 1 mm gives ~ 5 PD
- Unopposed recession gives essentially no alteration in primary position alignment

Oblique muscle surgery

- Tight IO recession 14 mm gives up to 15 PD hypoalteration in primary position, if present* and corrects a 3+ to 4+ IO overaction.
- IO myectomy acts similarly.
- Tight IO recession 10 mm gives up to 8 PD hypoalteration in primary position, if present* and corrects a 2+ IO overaction

Correction of alphabet patterns

-BIO weakening causes eso-shift about 15 PD of in upward gaze but has no effect on horizontal alignment in primary position or downward gaze.

-BSO weakening causes convergence about 25 - 45 PD in downward gaze, with up to 10 PD of convergence in primary position, and no effect or an exoshift in upward gaze.**

(*Calhoun, 1987*)

-Harley&Manley : average esoshift 14 PD (maximum 25 PD) in primary position

average esoshift 41 PD in downgaze

-Scott et al : average esoshift 12 PD in primary position

no esoshift in upgaze

average esoshift 45 PD in downgaze

-Diamond & Parks : average esoshift 0.7-1 PD in primary position (negligible)

- สรุปคือ For horizontal deviation with A pattern and at least 2+ SO overaction, DO NOT change the amount of horizontal rectus muscles surgery, because SO weakening does not significantly change the horizontal alignment in primary position. (*Wright, p206*)

-Silicone expander length for SO weakening :

SO overaction	Length of silicone
+1	4 mm
+2	5 mm
+3	6 mm
+4	7 mm

-Offsetting 2 horizontal rectus muscles one-half tendon width will correct ~ 15 PD of A or V pattern (Metz & Schwartz, 1977). Offsetting larger amounts give unpredictable results.

-Wright, p209 : As a rule, one-half tendon width of vertical displacement results in 10-20 PD of pattern correction. A full tendon with vertical displacement produces approximately 30 PD of correction and is reversed for extremely large patterns.

จาก Duane's clinical ophthalmology บทการรักษารักษา A และ V pattern

MR recession แก้ V ได้ 10 PD

MR infra-placement แก้ V ได้ 15 PD

IO recession OU แก้ V ได้ 15 PD

รวมทั้งสามอย่างแก้ V pattern ได้รวม up to 45 PD of V pattern

LR recession + LR infraplacement แก้ A ได้ 15-20 PD

หากมี A pattern มาก ๆ ต้องทำ SO tenotomy แก้ได้ 40 PD (ไม่มีผลต่อ 1 position deviation)

ผู้ป่วยที่มี 60 PD A pattern (ไม่บ่อย) → ต้องทำทั้ง SO tenotomy + LR infraplacement

ผู้ป่วยที่มี <40 PD A pattern (บ่อย) → ให้ทำ LR recession + infraplacement

ผู้ป่วยที่มี 40-55 PD A pattern + SO-OA → ให้ทำ SO tenotomy OU

XT-V pattern : IO recession แก้ V ได้ 15-25 PD (ขึ้นกับ severity of IO overaction)

LR recession + supraplacement แก้ V ได้ 15-20 PD

หากจำเป็นต้องแก้ V มาก ๆ → MR infraplacement แก้ได้อีก 15-20 PD

ผู้ป่วยตาตรงใน primary position แต่มี V หรือ A pattern มักจะมี oblique muscle dysfunction!!

ถ้ามี IO overaction → ก็ทำ IO recession

ถ้ามี SO overaction → ให้เลี้ยง SO weakening เพราะอาจเกิด PO torticollis

แต่ทำ vertical displacement of horizontal muscles ก็พอ

ผู้ป่วย high AC/A + V pattern ที่สวม bifocals ไม่สามารถมีตาตรงได้เมื่อมองผ่าน bifocal segment

เป็นเพราะ V pattern การรักษา : Miotics แทน bifocals หรือ

MR infraplacement ก็ช่วยได้

ผู้ป่วย A pattern + exophoria at near work ! เพราะมอง downgaze

การรีดักชัน : MR supraplacement

Surgery for partially accommodative ET (decompensated accommodative ET)

1. Standard surgery :

: general (Parks) = distance deviation with correction

: Wright p.187 = deviation with correction (usually average of N and D deviation) →

25% undercorrection

2. Augmented surgical formula (*Wright*)

$[N\text{ cc} + N\text{ sc}] / 2 \rightarrow 90\%$ success rate

for high AC/A : $[D\text{ cc} + N\text{ sc}] / 2 \rightarrow$ success rate may decrease

3. Rosenbaum AL, Jampolsky A., Scott AB 1974:

for high AC/A : target angle = D cc + 5 to 10 PD

4. O'Hara MA, Calhoun JH, 1990 :

for those with < 2.5 D hyperopia :: target angle = D sc

5. Prism adaptation

on Fresnel prism over full hyperopic correction → follow every 1-2 weeks

success rate 85% (compared with standard surgery 75%)

cost and time !!

6. MM Parks : **

normal AC/A → standard surgery

high AC/A → D cc and add 1 mm to each MR

Surgery for exotropia

1. Basic XT or simulated divergence excess

-full distance deviation based on ACT or patch test

-recess/resect in the past

-BLR recession works well (*Parks*)

2. True divergence excess

-more conservative, b/c correcting at distance deviation often leads to persistent ET at near

-if associated with high AC/A ratio : best to operate somewhere between D and N

deviations

-tell the patients that they may require reoperation / bifocal add / miotics drop postoperatively

BLR recession (in the past and at the present time)

3. Goal : small consecutive ET 8-15 PD (even large as 25 PD may resolve without further surgery)

-initial diplopia due to overcorrection usually resolves by 1-2 weeks

-children < 4 y. : part-time alternate patch to prevent suppression and amblyopia

-persistent ET 2-3 weeks : prism glasses to neutralize ET just aiming at small esophoria

-after 8 weeks of ET : consider reoperation

Surgical techniques for weakening of IO

Grading of IO	Parks	Wright	Von Noorden
1+	Recess 6	Recess (small)	Myectomy
2+	Recess 10	Recess (large)Myectomy	Myectomy
3+	Recess14	Recess c partial anteriorization Myectomy	Myectomy
4+	Denervation,extirpation	Full anteriorization (bilat surg only) Extirpation-denervation Myectomy	Myectomy