Plication augmentation of the modified Hummelsheim procedure for treatment of large-angle esotropia due to abducens nerve palsy and type 1 Duane syndrome

Michael Kinori, MD,a Kyle E. Miller, MD,a Megan Cochran, DO,b,c Preeti A. Patil, MD,a Mahmoud El Sahn, MD,a Salma Khayali, MD,a Shira L. Robbins, MD, FAAP,a Richard W. Hertle, MD, FAAP,b,d,e and David B. Granet, MD, FAAPa

(J AAPOS 2015;19:311-315)

Presented by Dina Elsayed, MD, FRCS

Methods

- Retrospective study
- Subjects: abducens nerve palsy or type 1 Duane syndrome
- Duction limitation was measured on a scale of 0 to -8, with 0 indicating full duction, -4 that the eye could rotate just to the midline, -5 that the eye could not rotate to the midline, and -8 that there was no abduction.

Surgical procedure

- GA
- Fornix incision
- Isolation of vertical recti and splitting in half (preserving a ciliary vessel)
- 5 mm plication of the lateral rectus muscle (6/0 polygalactin)
- transposing the muscles to the edges of the LR muscle (6/0 polygalactin), with foster suture 6-8 mm posterior to LR insertion
- MR recession 5mm or botulinum toxin injection 5IU
- Closure

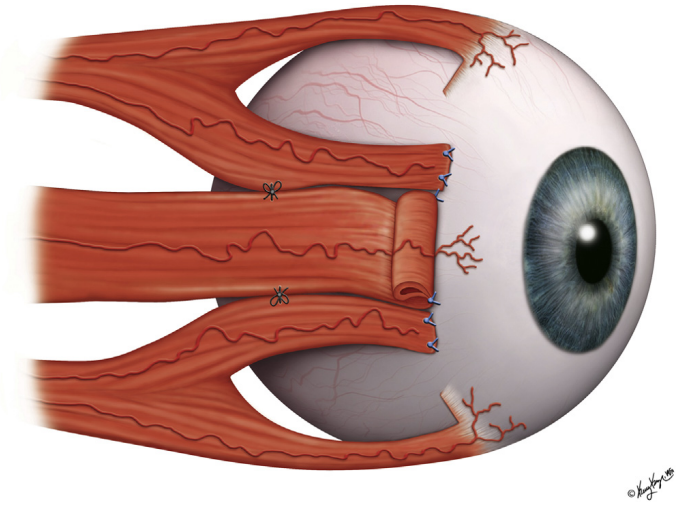


FIG 1. A plication augmentation Hummelsheim procedure performed on the right eye.

Patients with Abducens Nerve Palsy

Table 1. Pre- and postoperative deviation of patients with abducens nerve palsy

	Preoperative characteristics		Surgical details		Postoperative characteristics	
	Deviation, PD	Abduction deficit	FDT	Procedures (in addition to MH)	Deviation, PD	Abduction deficit
1	>95 ET	−8	Tight MR	Ipsilateral MR recession		
2	>95 ET	−6	Tight MR	Ipsilateral MR recession	10 ET, 20 RHT	−3
3	95 ET	−8	Tight MR	Ipsilateral MR recession	Small variable XT	−4
4	95 ET	−7	Normal	None[a]	Orthotropic	−3
5	>95 ET	−7	Tight MR	BT to ipsilateral MR	14 XT	−3
6	35 ET	−5	Tight MR	BT to ipsilateral MR	X 5	−2.5
7	50 ET	−6	Tight MR	None[b]	12 X(T)	−2
8	>50 ET	−6	Tight MR	BT to ipsilateral MR	14 ET	−4
9	25 ET	−5	Normal	None	8 E	−3

E, esophoria; *ET*, esotropia; *FDT*, forced duction test; *MH*, modified Hummelsheim; *MR*, medial rectus muscle; *PD*, prism diopter; *RHT*, right hypertropia; *X*, exophoria; *XT*, exotropia; *X(T)*, Intermittent exotropia.

[a]Botulinum toxin injection to the ipsilateral medial rectus 5 days postoperatively due to persistent diplopia.

[b]Although FDT was positive to abduction, after the transposition surgery FDT was positive to adduction and the static position of the eye was exotropic.

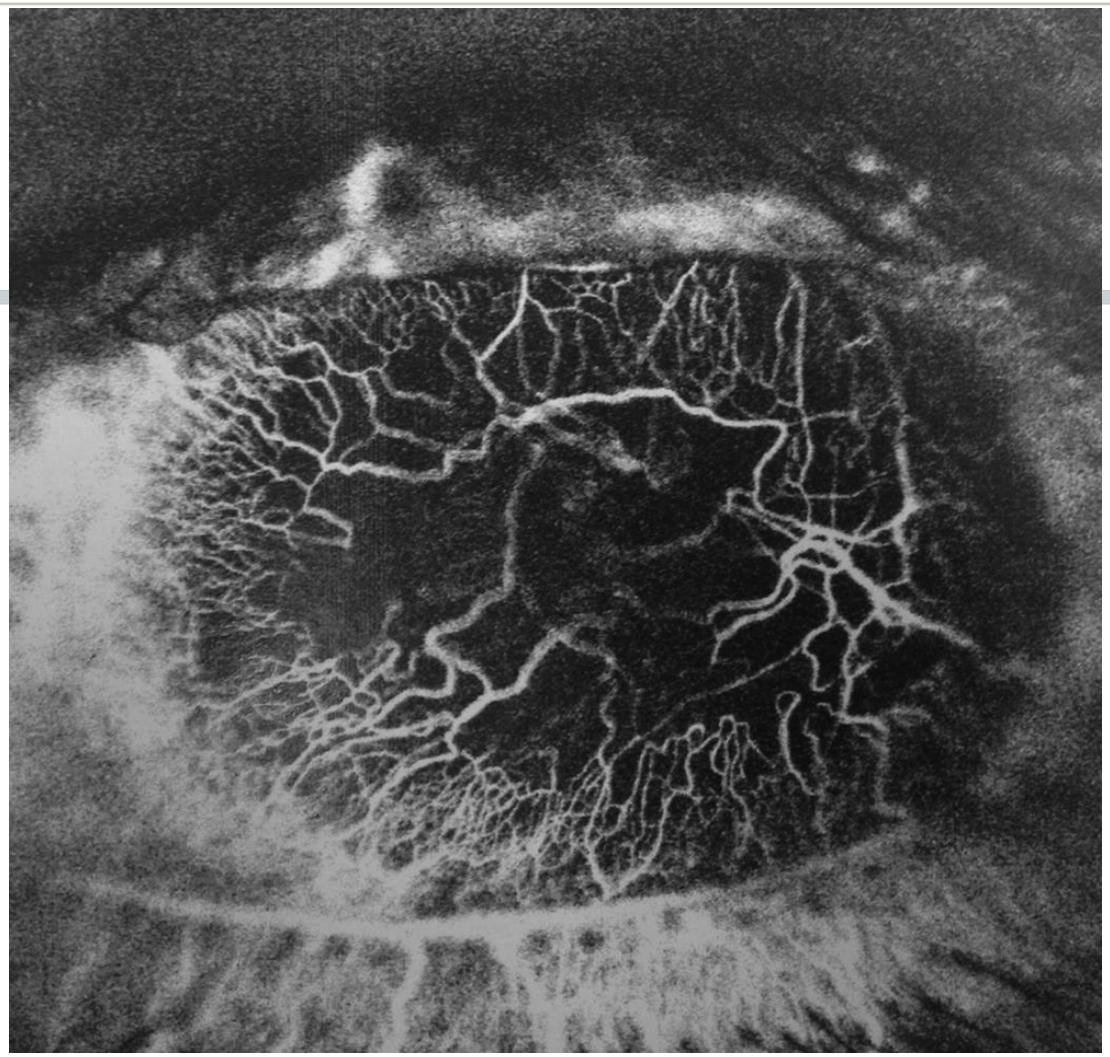


FIG 2. An iris Indocyanine Green (ICG) angiogram 10 weeks after a plication augmentation Hummelsheim procedure. Note 360 degrees of adequate blood flow to the anterior segment.

Table 2. Pre- and postoperative deviation of patients with type 1 Duane syndrome

	Preoperative characteristics		Surgical details		Postoperative characteristics	
Patient	Deviation, PD	Abduction deficit	FDT	Procedures (in addition to MH)	Deviation, PD	Abduction deficit
1	18 ET	−4	Tight MR	BT to ipsilateral MR		
2	20 ET	−5	Tight MR	BT to ipsilateral MR	Orthotropic	−3
3	12 ET	−4	Tight MR	None[a]	8 (X)T	−1
4	35 ET	−4	Tight MR	None[a]	Orthotropic	−1

ET, esotropia; *FDT*, forced duction test; *MH*, modified Hummelsheim; *MR*, medial rectus muscle; *(X)T*, intermittent exotropia.
[a]Although FDT was positive to abduction, after the transposition surgery FDT was positive to adduction and the static position of the eye was exotropic.

Conclusion

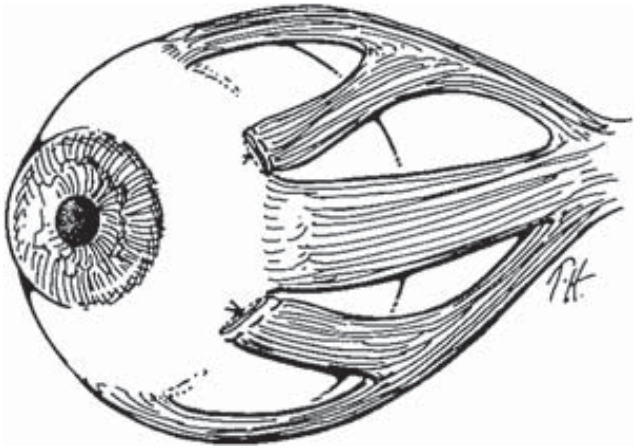
- The plication augmentation Hummelsheim procedure resulted in correction of even very large esodeviations and improvement of the abduction force. This procedure may also better preserve the blood supply to the anterior segment compared to other surgical approaches.

Limitations of the study

- retrospective nature and nonmasked approach.
- Comparison with other surgical approaches for abducens nerve palsy and type 1 Duane syndrome was not performed.
- The subsets reported were small
- Minor surgical variations between surgeons could potentially affect the results

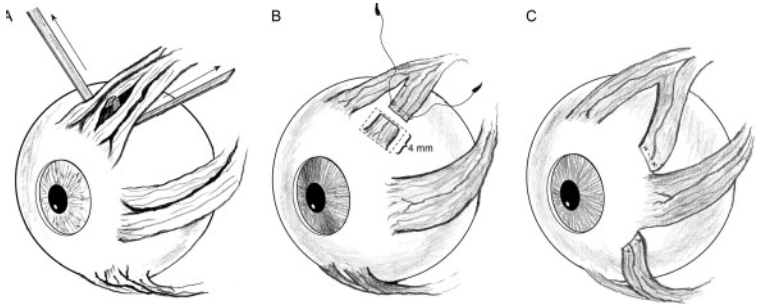
Original Hummelsheim

- The Hummelsheim Procedure involves splitting the vertical rectus muscles and reattaching the temporal halves of each vertical rectus muscle adjacent to the insertion of the lateral rectus muscle.



Brooks Resection Modification (Augmented Hummelsheim)

- resecting 4 mm to 6 mm of the transposed rectus muscle halves. Resecting some of the transposed muscle halves enhances the transposition by increasing the leash effect.

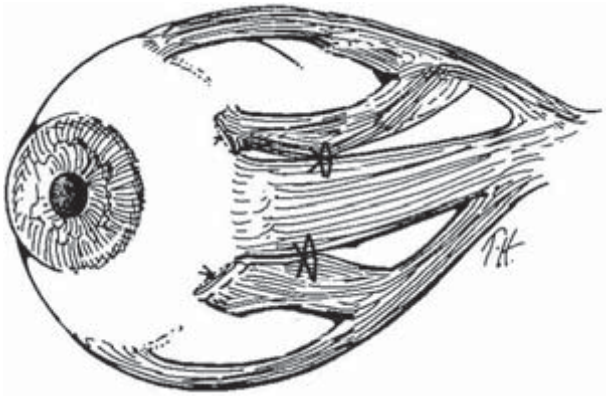


Foster Modification (Lateral Scleral Fixation)

- A lateral fixation suture of 5-0 Dacron polyester filament was placed in the sclera 16mm posterior to the limbus and adjacent to the lateral rectus muscle, incorporating one fourth of the transposed vertical rectus muscle.

Wright modification

- the transposed vertical rectus muscle halves are sutured to the lateral rectus muscle approximately 5mm to 6mm posterior to the lateral rectus insertion, increasing the effect of the transposition.



Thank you