Outcomes and Factors Associated with Successful Strabismus Surgery for Abducens Nerve Palsies: A Retrospective Study and Literature Review [Response to Letter]

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Dear editor

We read the article by Srimanan W recently published in Clinical Ophthalmology[1] with great interest. We really appreciate the author's attempt to find out factors associated with surgical success rate of abducens nerve palsy. However, we have certain concerns regarding this article that, if addressed, will further clarify the situation for better understanding. The following are the concerns.

1. Preoperative forced duction test (FDT) is very important for surgical planning of abducens nerve palsy as medial rectus muscle contracture is very common after abducens nerve palsy[2] which may cause abduction limitation beyond midline and might give false Information Classification: General impression of total abducens nerve palsy. We believe this should have been done before allocating patients to either group and surgical planning.

Response: In my clinical practice, I usually do not perform the force duction test in the outpatient setting. Instead, I perform this test in the operating room after the patient has been sedated, because there is a possibility of pain, tearing of the conjunctiva, or bleeding during the procedure. Before surgery, I assess ocular duction to determine the extent of movement limitation beyond the midline, which helps in choosing the appropriate surgical technique. For partial abducens nerve palsy, the preferred technique is non-vertical rectus muscle transposition. However, in complete abducens nerve palsy where limited abduction does not reach the midline, the vertical rectus muscle transposition technique is preferred.

2. The author has correctly used Mann–Whitney test at places with uneven distribution of data, however, used mean and SD as a measure of central tendency and measure of spread, respectively, in representation of post-operative angles which does not seem to be normally distributed data and their representation in median with range would have been more appropriate.

Response: Thank you for your valuable feedback. I have included the extended postoperative outcomes, providing the median and range for your review. The data are presented in two tables: the first outlines the overall postoperative strabismus angle outcomes, while the second details the postoperative results for the non-vertical rectus muscle transposition group compared to the vertical rectus muscle transposition group.

Table 1 Postoperative Strabismus Angle Outcomes

	Success	Non-Success	Total	p-value
	n	n	n	
Postoperative Angle (day 1)				<0.001
Mean±sd	2.12±3.56	22.57±19.66	6.59±12.59	
Median(min–max)	0(0–12)	15(1–60)	0(0–60)	
Postoperative Angle (1 week)				<0.001
Mean±sd	2.36±3.71	25.43±15.94	7.41±12.4	
Median(min–max)	0(0–10)	20(12–55)	1(0–55)	
Postoperative Angle (1 month)				<0.001
Mean±sd	1.48±2.54	26.14±17.48	6.87±13.09	
Median(min–max)	0(0–8)	20(14–60)	0(0–60)	
Postoperative Angle (3 months)				<0.001
Mean±sd	1.44±2.12	23.57±16.99	6.28±12.07	
Median(min–max)	0(0–6)	16(12–55)	1(0–55)	
Postoperative Angle (6 months)				<0.001
Mean±sd	1.84±2.23	24.43±17.47	6.78±12.37	
Median(min–max)	0(0–6)	18(12–60)	4(0–60)	
Postoperative Angle (1 year)				<0.001
Mean±sd	2.48±2.26	19.71±13.78	6.25±9.65	
Median(min–max)	2(0–8)	14(10–50)	4(0–50)	

Notes: Data are presented as the mean ± standard deviation (SD), median (interquartile range), or n (%) of patients.

Table 2 Subgroup Analysis of Postoperative Strabismus Angle in Non-Vertical Rectus Muscle Transposition and Vertical Rectus Muscle Transposition Groups

Non-Vertical Rectus Muscle Transposition				Vertical Rectus Muscle Transposition			
	Success	Non-Success	p-value		Success	Non-Success	p-value
Angle_day1			0.002	**Angle_day1**			0.018
Mean±sd	1.53±3.48	22.5±25.8		Mean±sd	3±3.68	22.67±12.7	
Median(min–max)	0(0–12)	14.5(1–60)		Median(min–max)	2(0–10)	30(8–30)	
Angle_1_week			0.001	**Angle_1_week**			0.010
Mean±sd	1.13±2.8	26.5±19.12		Mean±sd	4.2±4.26	24±14.42	
Median(min–max)	0(0–10)	18(15–55)		Median(min–max)	4(0–10)	20(12–40)	
Angle_1_mo			<0.001	**Angle_1_mo**			0.009
Mean±sd	0.67±1.8	27.25±21.99		Mean±sd	2.7±3.06	24.67±13.61	
Median(min–max)	0(0–6)	17.5(14–60)		Median(min–max)	2(0–8)	20(14–40)	

(*Continued*)

Table 2 (Continued).

Non-Vertical Rectus Muscle Transposition				Vertical Rectus Muscle Transposition			
	Success	**Non-Success**	**p-value**		**Success**	**Non-Success**	**p-value**
Angle_3_mo			0.001	**Angle_3_mo**			0.009
Mean±sd	0.93±1.67	24.25±20.56		Mean±sd	2.2±2.57	22.67±15.14	
Median(min-max)	0(0–4)	15(12–55)		Median(min-max)	1(0–6)	16(12–40)	
Angle_6_mo			0.001	**Angle_6_mo**			0.009
Mean±sd	1.2±1.82	26±22.8		Mean±sd	2.8±2.53	22.33±11.15	
Median(min-max)	0(0–4)	16(12–60)		Median(min-max)	4(0–6)	18(14–35)	
Angle_1_y			0.002	**Angle_1_y**			0.010
Mean±sd	2±2	24.5±17.23		Mean±sd	3.2±2.53	13.33±4.16	
Median(min-max)	2(0–4)	17(14–50)		Median(min-max)	3(0–8)	12(10–18)	

Notes: Data are presented as the mean ± standard deviation (SD), median (interquartile range), or n (%) of patients.

3. In the material and methods section treatment options discussed were unilateral medial rectus recession, monocular horizontal recession-resection, and bilateral medial rectus recession for partial abducens nerve palsy and full tendon vertical rectus muscle transposition to the lateral rectus muscle accompanied by Foster's suture surgery for complete abducens nerve palsy cases. However, in table 3 for subgroup analysis the author has mentioned three muscles were operated in 1 patient of each group. This seem to be a little confusing as it does not match the inclusion criteria described.

Response: Thank you for your valuable comment. I recognize that there may be flaws in the inclusion criteria, which I did not adequately address. Vertical deviations were observed in this study, which is consistent with evidence showing that such deviations can coincide with abducens nerve palsy.[1] Supplemental third muscle surgeries were performed in two cases to correct these vertical deviations.

The first case involved a patient with partial abducens nerve palsy who presented with slight preoperative hypertropia, which was treated with a temporal tenotomy of the superior rectus muscle. The second case, classified as complete abducens nerve palsy, exhibited over-elevation in adduction compared to abduction. In this instance, an inferior oblique myectomy was performed, guided by literature suggesting minimal impact on horizontal strabismus.[2–4]

While these procedures are less common and represented only a small portion of our series, we included them in the complete abducens nerve palsy group, which also underwent vertical rectus muscle transposition. Although including these cases may have introduced variability in the surgical outcomes, we believe it is important to report these cases as part of the broader spectrum of surgical interventions for abducens nerve palsy. By doing so, our study reflects the range of clinical presentations and the complexity of managing this condition, consistent with the variability in success rates reported in the literature.

4. In complications and reoperation section, the author has mentioned that two subjects who had initial horizontal muscle surgery did not achieve the desired outcome and underwent another horizontal muscle resection for correction. We presume that these two patients were from partial abducens nerve palsy group and we just wish to know that these two patients were allotted to which group – surgical success group or surgical non-success group?

Response: The cases requiring reoperation were diagnosed as partial abducens nerve palsy and were included in the non-success group.

Disclosure

The author reports no conflicts of interest in this communication.

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