Adjustment of Sutures 8 Hours vs 24 Hours After Strabismus Surgery

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• PURPOSE: **To compare the postoperative results of adjustable-suture strabismus surgery when suture adjustment was performed 8 hours (group 1) and 24 hours (group 2) after surgery.**

• METHODS: **A retrospective clinical study was conducted in two hospitals. Strabismus surgery and muscle adjustment were performed in 90 patients. All patients had horizontal strabismus (40 patients had esotropia and 50 patients had exotropia), and they underwent either primary surgery or reoperation. Mean age of the patients was 29.9 ± 14.1 (range, 14 to 74) years. The angle of deviation was measured in all patients before surgery, after surgery both before and after adjustment, and at the final follow-up examination. The follow-up period was 6 to 40 months (mean, 19.6 months).**

• RESULTS: **Preoperative data were similar in the two groups. The mean angle of deviation immediately after muscle adjustment was 0.6 ± 6.1 prism diopters in group 1 and 0.4 ± 6.3 prism diopters in group 2. This similar deviation in the two groups ($P = .9$) changed during the follow-up period, and at the final examination the measured angles in groups 1 and 2 were −1.0 ± 7.9 and −2.5 ± 10.3 prism diopters, respectively ($P = .48$). The most considerable outcome measure was the calculated drift values. At the last follow-up these values were −1.6 ± 5.8 for group 1 and −2.9 ± 11 prism diopters for group 2 ($P = .5$). Subdividing the patients on the basis of their deviation before surgery, a postoperative drift toward exotropia was found in most patients of group 1. In group 2, however, a greater tendency toward exotropia was shown only by those patients who had displayed exotropia preoperatively, whereas patients with preoperative esotropia showed a greater tendency toward esotropia after surgery.**

• CONCLUSION: **In patients undergoing horizontal extraocular muscle surgery with adjustable sutures, suture adjustment 8 hours or 24 hours after surgery did not produce significantly different results. (Am J Ophthalmol 2000;129:521–524. © 2000 by Elsevier Science Inc. All rights reserved.)**

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THE MAIN ADVANTAGE OF USING ADJUSTABLE SUtures in strabismus surgery is that they allow the surgeon to control almost immediately any postoperative overcorrections or undercorrections.[1–5] In addition, improved long-term surgical success rates have been reported.[1,2,6,7] A number of reports analyze the postoperative alignment and the long-term drift patterns of the operated eyes.[6–10] Timing of the muscle adjustment[11–13] is discussed by some authors. Immediate postoperative adjustment was found to be beneficial in some patients,[11] whereas one-stage intraoperative adjustable-suture surgery reportedly gave accurate alignment of the visual axes in others.[12] In one report postponement of adjustment for more than 24 hours was not recommended,[14] whereas in another study successful results were obtained after tying of the sutures was delayed for up to 1 week after surgery.[15] Most surgeons perform the adjustment 5 to 24 hours after surgery.[7–11] Adjustment 24 hours after surgery might be advantageous in patients who were heavily sedated during surgery or were given postoperative analgesics. In such patients, drowsiness after surgery might negatively affect their ability to cooperate during adjustment of the sutures. On the other hand, when adjustment is done as late as 24 hours after surgery rather than after 8 hours, the surgeon might encounter a more serious problem of muscle adherence to the sclera.

In the present study, we compared the results of muscle adjustment performed at two different times (8 hours and 24 hours) after strabismus surgery.

PATIENTS AND METHODS

THE RECORDS OF ALL PATIENTS WHO UNDERWENT ADJUSTable-suture strabismus surgery performed by the same surgeon at two medical institutes were reviewed. All preoperative strabismus measurements, strabismus surgery, and postoperative strabismus measurements were per-

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formed by the same person. Strabismus measurements were done by the prism and cover test for near and distance fixation in the primary position with the refractive correction; the average number of these two measurements was used for each patient. Krimsky test was used in patients with blind eyes. Included in the study were patients with horizontal strabismus only, and who underwent either primary surgery or reoperation. Patients with Graves ophthalmopathy, neurologic disorders, or traumatic strabismus were excluded in order to form more homogenous and similar study groups. Ninety patients were studied; all of them underwent surgery in the same time period. Mean age of the patients was 29.9 ± 14.1 years (range, 14 to 74 years). Forty patients had esotropia, and 50 patients had exotropia. All patients were followed up for at least 6 months (range, 6 to 40 months) with a mean follow-up time of 19.6 months. Surgery was performed under general anesthesia, and muscle adjustment was subsequently performed under topical anesthesia with 0.4% Benoxinate eye drops only. After a limbal conjunctival incision, the recessed muscle was suspended against the sclera (hangback) on a 6/0 Vicryl (Ethicon, Edinburgh, United Kingdom) tied with a bow-tie knot. The conjunctival incision was left open on an adjustable-loop suture.[16] In each patient only one adjustable suture was used.

Muscle adjustment was performed under topical anesthesia with 0.4% Benoxinate HCl eye drops, 8 hours (range, 7 to 9 hours) after surgery in all patients in one hospital, and 24 hours (range, 23 to 25 hours) after surgery in the other. This difference was dictated by the insurance terms, which permitted hospitalization in one hospital but not in the other. No postoperative analgesia was used. Postoperative adjustment was performed in any case of overcorrection and in cases of undercorrection of more than 10 prism diopters. The target was undercorrection of less than 10 prism diopters. Good cooperation during adjustment was obtained by most of the patients, because no significant pain was caused.

Data extracted from each chart included the type of strabismus (esotropia or exotropia), scope of surgery (monocular or binocular), classification (primary surgery or reoperation), and the angles of deviation before and after surgery, after muscle adjustment, and at the final follow-up examination. From these data, the amount of ocular drift was calculated by subtracting the angle of deviation after adjustment from the angle of deviation at the final examination. In addition, the mean of the absolute values of drift in either direction was calculated in each group. In this calculation, a drift (whether exotropic or esotropic) away from the postadjustment angle was recorded as a positive number. The operation was considered to be successful if the angle of deviation measured at the final follow-up examination was less than 10 prism diopters.

Differences between the two study groups in the proportion of the preoperative characteristics and postoperative ocular drift were assessed using chi-square test or Fisher exact test depending on the cell's size. Ocular drifts between postoperative suture adjustment and final examination were presented as mean values and standard deviation. Comparison of the ocular drifts between the two groups was performed using Student *t* test. Sample size of each study group was estimated based on power of 80% and confidence level of 95%.

TABLE 1. Preoperative Characteristics of Patients Who Underwent Adjustable-suture Strabismus Surgery

	Group 1 (n = 37)	Group 2 (n = 53)	*P* Value
Esotropia (%)	18 (49)	22 (42)	.6
Exotropia (%)	19 (51)	31 (58)	.6
Reoperation (%)	16 (43)	13 (25)	.1
Bilateral surgery (%)	6 (16)	8 (15)	.9

Adjustment was performed 8 hours after surgery in group 1 and 24 hours after surgery in group 2.

RESULTS

NINETY PATIENTS WERE INCLUDED IN THE STUDY. MUSCLE adjustment was performed 8 hours after surgery in 37 patients (group 1) and 24 hours after surgery in 53 patients (group 2).

The two groups were similar with regard to their age (29.1 ± 13.5 years in group 1 and 29.9 ± 14.5 years in group 2), their preoperative rates of esotropia (49% in group 1 and 42% in group 2) or exotropia (51% in group 1 and 58% in group 2), the number of reoperations (43% in group 1 and 25% in group 2), and the number of patients requiring bilateral surgery (16% in group 1 and 15% in group 2) (Table 1). Postoperatively, the need for adjustment of the muscle position was also similar (43% in group 1 and 47% in group 2). Similar success rates were achieved in the two groups (86% in group 1 and 81% in group 2).

At the final examination the angle of deviation was compared with the angle measured after muscle adjustment. The difference between these two measurements was defined as the ocular drift. The mean angle of deviation after adjustment was 0.6 ± 6.1 prism diopters in group 1 and 0.4 ± 6.3 prism diopters in group 2. The difference between the groups was not significant ($P = .9$). In both groups these values changed during follow-up, and at the final examination the measured angles of deviation were −1.0 ± 7.9 and −2.5 ± 10.3 prism diopters in groups 1 and 2, respectively ($P = .48$). The calculated drifts were −1.6 ± 5.8 prism diopters for group 1 and −2.9 ± 11 prism diopters for group 2 ($P = .5$). Calculation of the absolute drift, that is, the change in postadjustment angle of deviation in either direction, yielded mean values of

TABLE 2. Ocular Drift Between Postoperative Suture Adjustment and Final Examination

Group	Ocular Drift (PD)				Absolute Value of Drift (pd)	
	Mean	SD	Median	Range	Mean	SD
Group 1						
ET (n = 18)	0.6 XT	5.8	0	9 ET–20 XT	3.6	5.1
XT (n = 19)	2.6 XT	4.4	1 XT	10 ET–12 XT	4.5	4.4
Total (n = 37)	1.6 XT	5.8	0	10 ET–20 XT	6.0	5.2
Group 2						
ET (n = 22)	0.1 XT	13.5	1.5 ET	15 ET–25 XT	9.2	9.7
XT (n = 31)	4.9 XT	8.5	3 XT	15 ET–20 XT	6.7	7.1
Total (n = 53)	2.9 XT	11.0	0	15 ET–25 XT	9.8	8.1

ET = esotropic; PD = prism diopters; SD = standard deviation; XT = exotropic.
Absolute values express the deviation from orthophoria in either direction. Adjustment was performed 8 hours after surgery in group 1 and 24 hours after surgery in group 2.

TABLE 3. Number of Patients With Postoperative Ocular Drift According to Preoperative Strabismus Type

Preoperative Deviation	Group 1			Group 2		
	ET (%) n = 18	XT (%) n = 19	*P* Value	ET (%) n = 22	XT (%) n = 31	*P* Value
Drift to ET	5 (28)	4 (21)	0.7	12 (55)	4 (13)	.003
Drift to XT	7 (39)	10 (53)	0.6	6 (27)	20 (65)	.017
No drift	6 (33)	5 (26)	0.9	4 (18)	7 (22)	.7

ET = esotropia; XT = exotropia.
Muscle adjustment was performed 8 hours after surgery in group 1 and 24 hours after surgery in group 2.

6.0 ± 5.2 prism diopters in group 1 and 9.8 ± 8.1 prism diopters in group 2 ($P = .07$). The final drift values of each group, both as a whole and when subdivided into esotropic and exotropic patients, are summarized in Table 2.

Table 2 shows the average drift values for all esotropic or exotropic patients. We wished to determine the direction of the drift that occurred in each group, and this information is expressed in Table 3. During the postoperative follow-up period, 17 (46%) of the patients in group 1 and 21 (40%) in group 2 deviated toward 0 or remained orthophoric. A drift toward esotropia was found in 24% of patients in group 1 and in 30% of patients in group 2, and a drift toward exotropia was found in 46% and 49%, respectively. These differences between the groups were not significant. In both groups, however, the drift toward exotropia was more pronounced than the drift toward esotropia . When the groups were each subdivided on the basis of patients' deviation before surgery, a postoperative drift toward exotropia was found in most patients of group 1. In group 2, however, a greater tendency toward exotropia was shown only by those patients who had displayed exotropia preoperatively, compared with esotropic patients ($P = .017$), whereas patients with preoperative esotropia showed a greater tendency toward esotropia after surgery, compared with exotropic patients ($P = .003$) (Table 3).

DISCUSSION

IN THE PRESENT STUDY WE COMPARED THE RESULTS OF adjustable-suture strabismus surgery in which muscle adjustment, where necessary, was performed in two similar groups of patients under identical conditions but at two different times (8 or 24 hours after surgery). This comparison allowed us to isolate timing of suture adjustment as one of the factors that might affect the results of this operation. In reports of muscle adjustment after strabismus surgery, the timing of the adjustment procedure ranges from immediately after surgery[11] to as late as 1 week postoperatively.[15] Most surgeons perform the adjustment 5 to 24 hours after surgery.[7–11] Successful results have been reported with various times of adjustment, but there has been no systematic comparison of the effects of different adjustment times on the surgical results.

The two groups of patients compared in our study were similar with respect to preoperative parameters, such as the type of strabismus, angle of ocular deviation, and rate of reoperation. After surgery and before suture adjustment, patients in the two groups showed similar angles of deviation, and the number of patients requiring suture adjustment was similar in the two groups. Six weeks later, the calculated mean drift and the absolute deviation from the orthophoric condition were lower in group 1 (earlier adjustment) than in group 2, but the difference between the groups was not significant.

Both groups showed a tendency over time toward an

exotropic drift. However, it was impossible to predict the drift in individual cases, because a significant number of patients in both groups (28%) deviated toward esotropia. In other studies, both esotropic and exotropic patients showed a postoperative tendency toward exodeviation.[4,5,7,10] However, Weston and associates[8] found a significant drift toward exodeviation only in patients who were exotropic preoperatively, and negligible mean drifts in the alignments of esotropic patients, most of whom displayed an exotropic shift in primary surgery and an esotropic shift after reoperation. In another study[9] both esotropic and exotropic groups showed approximately equal tendencies to drift in either direction away from the mean postoperative values. Ward and associates[11] found that 72% of patients who underwent strabismus surgery with immediate postoperative muscle adjustment experienced a convergent horizontal shift 1 day after surgery, regardless of preoperative convergent or divergent deviation. In this report further follow-up of the ocular alignment was not described.

The difference between the two groups of the calculated drift observed in our study sample was negligible, but because of the sample size in each group and the fact that the standard deviation of the two groups were different, the 70% power was reached. Therefore, these findings must be confirmed by additional studies.

In comparing the adjustments performed 8 hours and 24 hours postoperatively, no differences were apparent technically in the recessing or advancing of the muscle. The timing of the adjustment also did not affect the adherence of the muscle to the sclera.

The conclusion drawn from this study is that muscle adjustments performed 8 or 24 hours after horizontal strabismus surgery had similar effects on the final surgical results in terms of the success rates of ocular alignment, as well as the postoperative direction and amount of ocular drift.

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