

# A survey of outcome of adjustable suture as first operation in patients with strabismus

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**Abstract** **Background:** Adjustable suture used for years to improve the outcome of strabismus surgery. We surveyed outcome of our patients with strabismus who underwent adjustable suture.

**Materials and Methods:** This retrospective study was performed at Ophthalmology Centre of Feiz Hospital in Isfahan on 95 participants that candidate for adjustable suture strabismus surgery. Patients were divided into three age groups: Under 10 years, 10-19 years, and 20 years and over. Outcome of adjustable suture surgery consequence of residual postoperative deviation was divided into four groups: Excellent, good, acceptable, and unacceptable.

**Results:** Out of 95 patients studied, 51 (53.7%) were males and 44 (46.3%) were females. The mean of deviation angles were  $53.8 \pm 17.9$  PD (Prism dioptres) in alt XT,  $44.5 \pm 12$  PD in alt ET and  $52 \pm 13.5$  PD in const ET,  $47.1 \pm 13.1$ PD in cons XT, respectively. There was no significant difference between the groups ( $P = 0.051$ ). Results of surgery were in 38 patients (40%) excellent, in 31 patients (32.6%) good, in 19 patients (20%) acceptable, and in 7 patients (7.4%) unacceptable. Seven (7.4%) patients required reoperation.

**Conclusions:** In the present study, the frequency of re-operation was much lower than other similar studies (7.4% vs. 30-50%). This suggests that the adjustable technique that used in our study can be associated with lower reoperation than other adjustable techniques used in the other similar studies.

**Key Words:** Adjustable sutures, complex strabismus, pediatric strabismus, strabismus surgery

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## INTRODUCTION

Strabismus is the term used to describe an anomaly of ocular alignment. Strabismus has a prevalence rate approximately 2% to 4% of the population.<sup>[1-3]</sup> Risk factors for strabismus include a positive family history and low birth weight.<sup>[4]</sup>

Strabismus can be treated as medical or surgical treatment depending on the type of strabismus. Strabismus surgery has a high success rate in both children and adults, and may be useful in

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improving diplopia, binocular fusion, and psychosocial functioning.<sup>[5,6]</sup>

Methods of external eye muscle surgery are different and include the use of adjustable suture or nonadjustable suture<sup>[7]</sup> and to get late acceptable results.<sup>[8]</sup> The adjustable suture technique is used for years to improve the outcome of strabismus surgery.<sup>[9]</sup> The main purpose of using this method is to achieve a good result in one procedure but in the nonadjustable suture technique, it sometimes require multiple surgeries to achieve good results.<sup>[10]</sup> The adjustable suture technique is used when reoperation with nonadjustable suture is highly probable and the results are unpredictable, for example in restrictive strabismus like thyroid orbitopathy, previous surgery on the eye muscles and excessive deflection angle.<sup>[11,12]</sup> The adjustable suture is used mostly in muscle recession.<sup>[13,14]</sup>

Previous studies show that the reoperation rate is reduced to 10.5% with use of adjustable suture and this technique has improved the outcome of strabismus surgery.<sup>[9-11]</sup> While some case series have reported improved outcome using adjustable sutures, others have shown no benefit and found no evidence to support the use of adjustable sutures when performing strabismus surgery.<sup>[11,15,16]</sup>

We performed a study on adults and children who had undergone strabismus surgery with adjustable sutures at Feiz Hospital in Isfahan to determine outcome of our patients who underwent the adjustable technique.

## MATERIALS AND METHODS

This retrospective study was done at Ophthalmology Centre of Feiz Hospital in Isfahan from February 2012 to February 2013. The study population consisted of 95 participant candidates for adjustable suture strabismus surgery. Inclusion criteria were consent to participate in the study and first strabismus surgery with adjustable suture. Patients who did not return for follow-up after surgery were excluded from the study. All patients had informed consent.

After collecting demographic data such as age and gender, patients were divided into three age groups: Under 10 years, 10-19 years, and 20 years and over. Type of patient's strabismus before surgery or esotropia and exotropia, intermittent or constant deviation, the first postoperative deviation and number of reoperation were recorded.

On the day of surgery, all adult patients were placed under general anesthesia. Children were placed under

topical anesthesia with Tetracaine (Tetracaine 0.5% ophthalmic drops, Darou Pakhsh Phama Co., Iran). After opening the conjunctiva fornix base, muscles were disinserted and if necessary resection was done then reattachment was performed. Muscles were attached to the sclera with simple stitches and three nodes, and then the conjunctiva was sutured. The next day, under local anesthesia the deviation was determined with Krinsky test, Hirshburg test, and alternative cover test. Based on the test results, adjustment was done and carried out the final node. After 3 days, patients were examined again and adjustment was done again if it was necessary and final adjustment was performed 1 week later if needed.

Next, the patients were asked to come to the ophthalmology clinic for post strabismus surgery examination at the certain times. Surgery results were evaluated using the cover-uncover test, Hirschberg test, and Krymsky test. The alignment of the eye, under correction, and overcorrection were determined.

Outcome of adjustable suture surgery consequence of residual postoperative deviation was divided into four groups: Excellent (perfect aligned eyes after strabismus surgery), good (residual postop deviation <8 Prism dioptres (PD)), acceptable (acceptable cosmetic or residual deviation 8-15 PD), and unacceptable (residual postop deviation >15 PD).<sup>[17]</sup>

The data collected was analyzed using chi-square and t-test with SPSS software version 20.

## RESULTS

Out of 95 patients studied, 51 (53.7%) were males and 44 (46.3%) were females. 48 (50.5%) of these patients were under 10 years old, 21 patients (22.1%) aged 10-19 years, and 26 patients (27.4%) were aged 20 years and above [Table 1]. In Table 2, the frequency of age group has been shown by sex. In the chi-square test, there was no significant difference in the age distribution of patients according to sex. Types of strabismus were: In 29 patients (30.5%) alternating

**Table 1: Patient baseline characteristics**

Variable		Male	Female
Age group	<10 years	51	50
	10-19 years	23.5	20.5
	≤20 years	25.5	29.5
Type of strabismus	Alt. XT	37.3	22.7
	Alt. ET	37.3	63.6
	Cons. ET	7.8	2.3
	Cons. XT	17.6	11.4

Alt. XT: Alternating exotropia; Alt. ET: Alternating esotropia; Cons. ET: Constant esotropia; Cons. XT: Constant exotropia

**Table 2: Distribution of outcome in terms of patient variables**

Variable		Result of surgery (Percent)				P-value
		Excellent	Good	Acceptable	Unacceptable	
Sex	Male	20 (52.6)	14 (45.2)	11 (57.9)	6 (85.7)	0.28
	Female	18 (47.4)	17 (54.8)	8 (42.1)	1 (14.3)	
Age (year)	<10	20 (52.6)	14 (45.2)	10 (52.6)	4 (57.1)	0.43
	10-19	9 (23.7)	10 (32.3)	2 (10.5)	0 (0)	
	20=<	9 (23.7)	7 (22.6)	7 (36.8)	3 (42.9)	
Type of strabismus	Alt.XT	12 (31.6)	12 (38.7)	4 (21.1)	1 (14.3)	0.2
	Alt.ET	20 (52.6)	15 (48.4)	10 (52.6)	2 (28.6)	
	Cons ET	2(5.3)	1 (3.2)	0 (0)	2 (28.6)	
	Cons XT	4 (10.5)	3 (9.7)	5 (26.3)	2 (28.6)	
Angel of deviation (PD)	Mean	45.9±12.3	49.2±14.3	48.4±19.7	54.3±12.7	0.53

Alt. XT: Alternating exotropia; Alt. ET: Alternating esotropia; Cons. ET: Constant esotropia; Cons. XT: Constant exotropia; PD: Prism diopters

exotropia (alt.XT), in 47 patients (49.5%) alternating esotropia (alt.ET), in 5 patients (5.3%) cons ET, and in 14 patients (14.3%) const XT. In Table 3, the frequency of strabismus by age group is shown. Fisher's exact test showed a significant difference in type of strabismus between the age groups ( $P < 0.001$ ).

The mean preoperative angle of deviation in patients was  $48.1 \pm 14.7$  prism dioptres (PD) with range of 90-30 PD. The mean of angle deviation was  $48.6 \pm 17.6$  PD in men and  $47.5 \pm 10.5$  PD in women and the difference between two groups was not significant ( $P = 0.71$ ). The mean of deviation angle in patients under 10 years, 10-19 years, and 20 years and older was respectively,  $44 \pm 11.9$  PD,  $50.7 \pm 18.2$  PD, and  $53.7 \pm 14.4$  PD and according to the one-way ANOVA, the difference was significant ( $P = 0.015$ ).

The mean of deviation angle were  $53.8 \pm 17.9$  PD in alt.XT,  $44.5 \pm 12$  PD in alt ET and  $52 \pm 13.5$  PD in const ET,  $47.1 \pm 13.1$  PD in const XT, respectively. There was no significant difference between the groups ( $P = 0.051$ ).

Results of surgery were in 38 patients (40%) excellent, in 31 patients (32.6%) good, in 19 patients (20%) acceptable and in 7 patients (7.4%) unacceptable. Seven (7.4%) patients required reoperation. In Table 3, distribution of outcome in terms of patient variables is shown. Fisher's exact test and ANOVA showed that there was no significant difference ( $P > 0.05$ ) in the result on the data by age, sex, type of strabismus, and angel of deviation. The mean angel of deviation in patients with excellent result was  $45.9 \pm 12.3$  D.

## DISCUSSION

The goal of strabismus surgery is to correct alignment of the eyes to promote fusion, recover vision using two eyes with overlapping fields of view, allowing good perception of depth, enlarge the field of vision without

**Table 3: Distribution of types of strabismus in age groups**

Type of Strabismus	Age group					
	<10 years old		10-19 years old		≤20 years old	
	Number	Percent	Number	Percent	Number	Percent
Alt.XT	13	27.1	10	46.7	6	23.1
Alt.ET	34	70.8	8	38.1	5	19.2
Cons ET	1	2.1	1	4.8	3	11.5
Cons XT	0	0	2	9.5	12	46.2
Total	48	100	21	100	26	100

$P < 0.001$

Alt. XT: Alternating exotropia; Alt. ET: Alternating esotropia; Cons. ET: Constant esotropia; Cons. XT: Constant exotropia

diplopia, and obtain normal eye contact.<sup>[18]</sup> The aim of this study was survey of outcome of adjustable suture surgery in patients with strabismus in Feiz Hospital at Isfahan. Patients, who participated in this study, at first, were studied in terms of age, gender, and type of strabismus and the impact of these factors were studied in outcome of surgery. According to our results, no significant difference in outcome in terms of those variables was found; thus, the confounding effect was neutralized in consequence of these factors and our results were relevant to outcome of adjustable suture for treatment of strabismus. Based on our study results of adjustable suture surgeries were 40% excellent, 32.6% good, 20% acceptable, 7.4% unacceptable, and 7.4% of the patients required reoperation. The mean angel of deviation in patients with excellent result was  $45.9 \pm 12.3$  D.

Our findings are similar to the results of Tripathi *et al.* who reported that strabismus surgery with adjustable sutures had significant better results than surgery without adjustable sutures. In the study of Tripathi, the re-operation rates for adjustable suture were 8.5% and in non-adjustable were 27.2%.<sup>[14]</sup> Some other previous studies show that the rate of postoperative adjustment is usually between 39% and 50%.<sup>[19-21]</sup>

Our findings showed that 40% of patients had excellent surgery result. Study of Zhang and colleagues confirms our results. In this study on 305 patients with adjustable suture, 47% had excellent outcome after surgery.<sup>[17]</sup>

Recent studies have shown better success rates when using adjustable sutures versus non-adjustable sutures in patients with strabismus surgery.<sup>[22]</sup> Nevertheless, some studies report no advantage of adjustable sutures. Park *et al.* found that strabismus surgery with adjustable sutures did not show significantly better results than surgery without adjustable sutures. They surveyed adjustable suture in the treatment of 20 patients with sensory exotropia who had underwent unilateral lateral rectus recession and medial rectus resection.<sup>[23]</sup> Bishop and Doran in a retrospective study on 52 patients with strabismus found 81% success rate in adjustable suture and 88% in non-adjustable suture. Results of this study showed equal success rates of adjustable and non-adjustable suture.<sup>[16]</sup>

However, a review study by Cochrane in 2005 suggested that the few numbers of retrospective studies directly compared adjustable and non-adjustable suture techniques and most of them were nonrandomized. Because of clinical heterogeneity of previous studies, they were difficult to compare and advantages of adjustable suture surgery in general or of any approach were not reliable.<sup>[11]</sup>

On the other hand, patient satisfaction from results of strabismus surgery is very important. In a study on 14 patients with thyroid ophthalmopathy, 7 patients underwent non-adjustable suture surgery and 7 patients underwent adjustable suture surgery. Patients with adjustable suture had no reoperation and all the patients were satisfied with the results but only 42.8% of patients with non-adjustable suture were satisfied with the results. Two patients of this group required reoperation and two patients needed prismatic correction.<sup>[24]</sup>

In study of Eino *et al.*, 104 patients with strabismus were divided into four groups. The first group consisted of esotropia (ET) patients who underwent surgery for the first time, the second group had ET patients undergoing reoperation, the third group had exotropia (XT) patients who underwent surgery for the first time, and the fourth group had XT patients undergoing reoperation. The corresponding surgical success rates were 82.4%, 92.6%, 93.1%, and 94.4% in the four groups, respectively,<sup>[25]</sup> which is close to our results.

However, adjustable sutures is not a common practice among the strabismus surgeons, partly because of insufficient evidence that the considerable extra investment of time and effort is worth the benefit, and partly because of the lack of proper training of details and benefits of this technique. As a result, many strabismus surgeons do not perform adjustable suture surgery and become confident that there is no benefit.<sup>[26]</sup>

In the present study, the frequency of re-operation was 7.4%. Similar studies reported various results, whereas Dawson *et al.* mentioned 5.1% for reoperation rate and Leuder *et al.* reported 15% reoperation rate in adjustable suture strabismus surgery.<sup>[27,28]</sup>

## CONCLUSION

It is suggested that the method used in the present study for adjustable suture is proper for adjustable suture strabismus surgery.

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