ORIGINAL ARTICLE

SURGICAL OUTCOMES OF STRABISMUS CORRECTION IN LARGE ANGLE EXOTROPIA

Rahmah Sadida[1], Liana Ekowati[2], Arnila Novitasari Saubig[2]
[1] Ophthalmology Resident, Faculty of Medicine Diponegoro University / Dr Kariadi General Hospital, Semarang
[2] Subdivision of Pediatric Ophthalmology and Strabismus, Faculty of Medicine Diponegoro University / Dr Kariadi General Hospital, Semarang
Email: rahmah.sadida@gmail.com

ABSTRACT

Introduction and Objective: *Surgery is one of the treatment options for strabismus. The success rates of surgical interventions, as reported in a number of different studies, vary widely. There is no database of surgical outcome in large angle exotropia patient undergoing surgery in Semarang, Central Java.*
This study aims to evaluate the surgical outcome of strabismus correction in large angle exotropia in Dr. Kariadi General Hospital.

Methods: *A retrospective study held from the medical record of patients with diagnosis large angle (>50Δ) exotropia undergoing strabismus correction surgery from January 2020-December 2022 in Dr. Kariadi General Hospital, Semarang. The clinical characteristics: sex, age, angle of exodeviation, amblyopia condition, sensory deprivation, and postoperative alignment were obtained. Surgical outcome measured with follow up of angle deviation in one month dan three months follow up after surgery.*

Results: *Totally 59 large angle exotropia patients were obtained with 31 (53%) were woman and 28 (47%) were man, range aged 1 year to 53 years old had preoperative angle of exodeviation 51->85 Δ, 6 (10%) had amblyopia, 11(18.6%) had sensory deprivation. By the 3 months post-operative visit, 100% of all patients reported orthophoria.*

Conclusion: *This study found the outcome of strabismus correction for large angle exotropia is satisfactory. Two- or three-muscle surgery provides an effective means for treatment of large angle exotropia.*

Keywords*: large angle exotropia, exodeviation, strabismus*

INTRODUCTION

Exotropia is a type of eye misalignment, where one eye deviates outward. The deviation may be constant or intermittent, and the deviating eye may always be one eye or may alternate between the two eyes. [1]

It is important to monitor all patients with exotropia as some will require treatment. Opinions vary widely regarding the timing of surgery and the use of nonsurgical treatments. Patients who have well-controlled, asymptomatic intermittent exotropia and good binocular fusion can be observed. [1]

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Untreated strabismus often results in poor self-esteem in both adults and children. Adults with strabismus report a wide range of difficulties with social interactions, which improve significantly after surgery. [1]

Surgical treatment of exotropia typically consists of bilateral lateral rectus muscle recession or unilateral lateral rectus muscle recession combined with medial rectus muscle resection. [1]

Large-angle exotropia has been variedly defined in the literature. Various studies have used a cut-off value of 40–60 PD to define large-angle exotropia. The management of large-angle exotropia is challenging.[2] Large (>50Δ) deviations may require surgery on 3 or 4 muscles.[1]

Surgery is one of the treatment options for strabismus. The success rates of surgical interventions, as reported in a number of different studies, vary widely. There is no database of surgical outcome in large angle exotropia patient undergoing surgery in Semarang, Central Java**.**

This study aims to evaluate the surgical outcome of strabismus correction in large angle exotropia in Dr. Kariadi General Hospital.

METHODS

A retrospective study of 59 patients with large angle exotropia in Dr. Kariadi Hospital, Semarang was held. Inclusion criteria were all large exotropia patients registered as outpatient in Pediatric Ophthalmology and Strabismus clinic who underwent Strabismus Correction from January 2020 -December 2022 diagnosed by Pediatric Ophthalmology and Strabismus consultant.

Patients who did not show up for follow-up in one or three months were excluded; and patients which had incomplete medical record. The Pediatric Ophthalmologist and Strabismus evaluated all of the patients based on the typical clinical presentation of angle deviation with Strabismus examination.

In the prism and alternate cover test, prisms of varying strengths are held over 1 eye or both eyes during alternate cover testing; the amount of prism that neutralizes the deviation, so that eye movement is no longer seen as the occluder is moved from 1 eye to the other, represents the magnitude of the deviation.

This test measures the total deviation (heterotropia plus heterophoria) and is often used as the strabismus surgery target.[1] The Krimsky test uses prisms to quantify the decentration of the corneal reflections from a handheld light. This examination used for uncooperative patients.

Angel deviation was measured before surgery, day 1 after surgery, 1 month after surgery and also 3 months after surgery. Medical records were reviewed to obtain the clinical characteristics of patients including sex, age, amblyopia condition, sensory deprivation and postoperative alignment.

Snellen chart and cycloplegic refraction were used to assess visual acuity and amblyopia condition. Sensory deprivation were obtained from segmen anterior using slit lamp and fundus examination using 78D or 90D Volks© condensing lens.

The study was approved by the research ethics committee of Medical Faculty Diponegoro University. Data were analyzed using statistical software program SPSS V26.0.

RESULTS

From January 2020-December 2022, there were 162 patients registered with exotropia in their ICD-10 diagnosis, 103 patients were excluded and 59 patients with large angle exotropia were included in the study. Demography characteristics of the patients are shown in Table 1.

Table 1. Demography characteristics of large angle exotropia patients (n=59)

Demography Characteristic	Frequency	%
Sex		
Men	28	47
Women	31	53
Age		
0-5 y.o	13	22
6-11 y.o	18	30
12-25 y.o	17	29
26-45 y.o	7	12
46-65 y.o	4	7
Avg (years)	16	
SD	13	

y.o: years old; Avg: average; SD: standard deviation

59 patients were divided into age range. The youngest participants were 1 year old, while the oldest were 53. Large angle exotropia subjects were composed mainly 31 (53%) of women.

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Table 2. Clinical characteristics of large angle exotropia patients (n=59)

Clinical Characteristic	Frequency	%
Amblyopia		
Yes	6	10
No	53	90
Sensory Deprivation		
Cataract	6	
Papil atrophy	3	
Glaucoma	2	
Total	11	18.6

The most angle deviation was more than 60 prism diopter (PD) (90%). 6 (10%) subjects have angle deviation 50-60 PD. Study subjects underwent strabismus correction surgery on 2 or 3 muscles and came follow up at first month. By the 3 months post-operative visit, 100% of all patients reported orthophoria (0 PD).

Table 3. Pre and post- operative angle deviation (n=59)

Angle deviation Pre - op	Frequency	%	1st month post-op	3rd months post-op
50-60 PD	6	10	0 PD	0 PD
>60 PD	53	90	0 PD	0 PD

Pre-op, Pre-operation;post-op, Post-operation;PD, Prism diopter

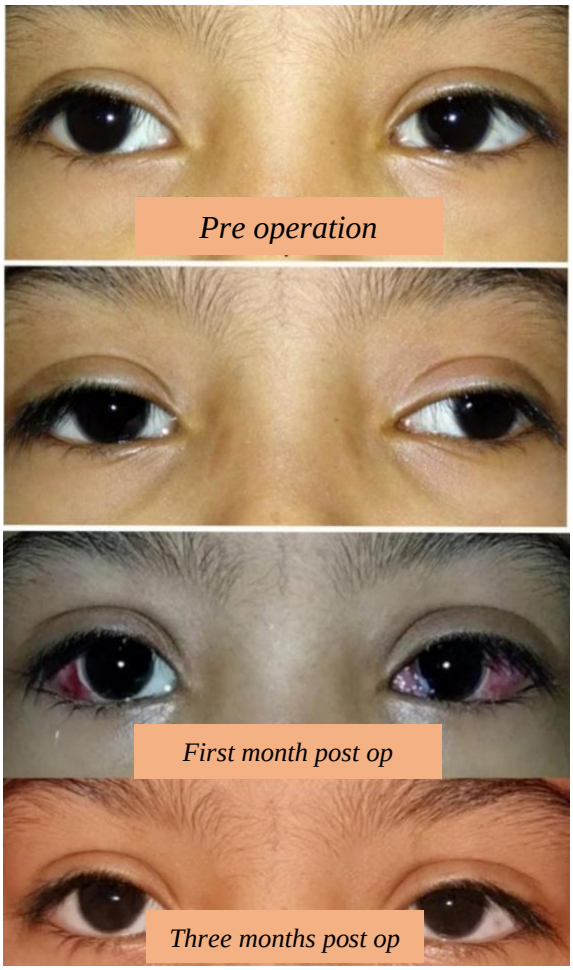

Figure 1. Preoperative photograph of a patient with 70 PD exotropia. Three months postoperative photograph of patient showing good alignment.

Figure 1 showed photograph study subject pre operative, final alignment of the subject showing good alignment in primary position. Figure 2 showed photograph subject showing immediate postoperative photograph of patient, and also photograph three months postoperative. Both subjects showed good alignment after strabismus correction surgery.

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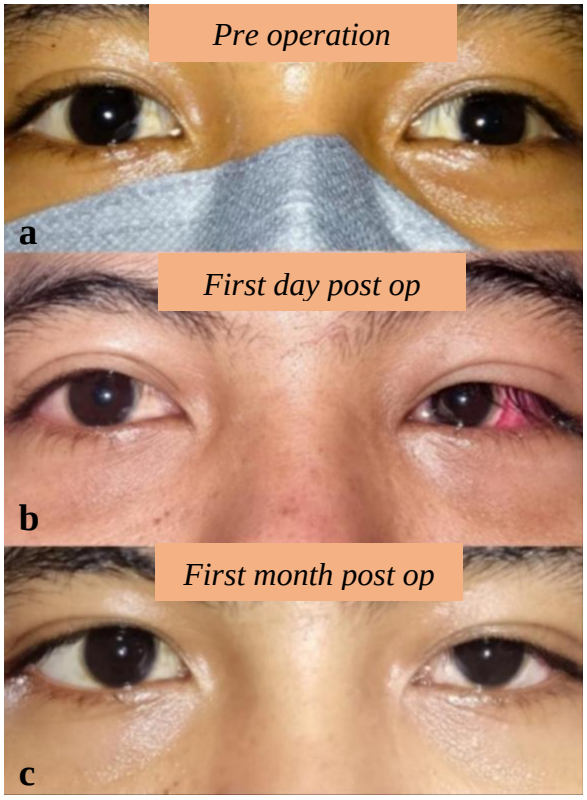

Figure 2. (a) Preoperative photograph of a patient with 65 PD exotropia. (b) Immediate postoperative photograph of patient showing satisfactory alignment with 2 rectus surgery. (c) First month visit to clinic photograph of patient showing good alignment.

DISCUSSION

This study subject comprised 59 patients aged 1-53 years old. This is consistent with largest reported studies that stated that the age of large angle exotropia over a wide range. It has been previously studied that exotropia dominantly presents in woman. [2–7] Similarly, we found that 31 out of 59 (53%) patients were woman.

6 (10%) study subjects amblyopia with the severity moderate to severe amblyopia. With a prevalence of 2%–4% in North America, amblyopia accounts for more cases of childhood-onset unilateral impaired vision than all other causes combined. Additionally, it is the most frequent reason for unilateral vision impairment in persons under 60.[1]

People who are prematurely born, have developmental delays, or have a family history of strabism or amblyopia are more likely to experience it. The minority of study subjects had amblyopia, this was consistent with the literature that amblyopia develops in approximately 50% of children who have esotropia, not exotropia. [1]

Even though patients with exotropia may also develop amblyopia, the risk of amblyopia is higher in constant exotropia than in intermittent exotropia.[1]

Visual deprivation amblyopia which is due to an eye abnormality that obstructs the

visual axis or otherwise interferes with central vision. The most common cause is congenital or early-acquired cataract; other causes include severe blepharoptosis, periocular lesions obstructing the visual axis, corneal opacities, and vitreous hemorrhage.[1]

Our study espouses that statement where there were 11 (18.6%) study subjects had sensory deprivation including cataract as risk factor.

A variety of posteoprative alignment can occur in large angle exotropia strabismus surgery. A small-angle esotropia in the immediate postoperative period tends to resolve and is desirable because of its association with a reduced risk of recurrent.[1]

Lau et al reported a success rate of 88.2% with one-stage three-muscle surgery in 24 patients with >60 PD exotropia in their intermittent group and 42.9% in their constant group. Li et al achieved a success rate of 83% using three-muscle surgery in 23 patients with a mean exodeviation of 130 PD.[6]

Asafali et al reported an overall success rate of 71% at 6 months, and also observed a better success rate in patients who were orthotropic/overcorrected on the first postoperative day. None of their study subjects needed a re-surgery, and all the patients were satisfied with the cosmetic outcome. [2] It was similar to this study, by the 3 months post-operative visit, 100% of all patients reported orthophoria.

This study has several limitations that should be noted. It was a retrospective study with a relatively small sample size. The onset of exotropia was based on patient history, which can be subject to recall bias. Patients were not followed until 6 months visit post operatively and also not in the same surgical procedures, there were two and three muscles surgery.

Finally, there were variations in the follow-up times among individual cases and the average follow-up period may have been too brief for evaluating the successful rate and long-term therapeutic outcome.

CONCLUSION

This study found the outcome of strabismus correction for large angle exotropia is satisfactory. Two- or three-muscle surgery provides an effective means for treatment of large angle exotropia.

Further research can be carried out long term evaluation until 6 months post operatively to evaluate is there any recurrent or residual deviation after strabismus surgery.

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