



## SUCCESS RATE OF STRABISMUS SURGERY IN ADULT PATIENTS

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## ABSTRACT

**Background Purpose.** Adults as well as children may have problems with strabismus, which can significantly affect quality of social and professional life. Strabismus surgery in adults are not conditioned for years of a patient, and the main goal of this kind of surgery is to improve motoric-senzorial relationship of eyes, and to improve esthetic moment of a patient.

**Patients&Methods.** A surgical review was performed on 35 adult patients with strabismus in period between January 2016 - May 2018 years. The type of strabismus, preoperative measurements, and indications for surgery were obtained from the patient notes, as were all final outcomes. Final measurements, on average, were 3 to 6 weeks postoperatively, and patients were asked to comment subjectively on their outcome.

**Results.** In total number 35 of adult strabismic patients, were 12 (34,3%) male and 23 (65,7%) female, mean age 34,15±13 (20 to 67 years), 17 patients (48,6%) were exotropic, esotropic 11 (31,4%) patients, and hypertropic 7 (20%) patients. Indication for surgery in the most cases were aesthetic 28 (80%). The success rate is measured by number of orthophoric patients with less than 10 prism diopters 31 (88,6%), stereoacuity 22 (62,9%) and patient satisfaction 30 (85,7%).

**Conclusion.** Adult strabismus surgery is very successful and provides patients with a good level of satisfaction. Many patients seek surgical correction for cosmetic and psychosocial benefits.

**Keywords:** adult, strabismus, success, surgery

## INTRODUCTION

Strabismus or eye misalignment is both a medical as well as psychosocial problem.

Medical(functional)problems involve: asthenopia, diplopia, suppression, limitation or lack of fusion and stereopsis, torticollis and possible monocular and binocular changes of vision.

Psychological and social problems are sometimes even greater than medical problems because patients with strabismus may experience a handicap in everyday life and in communication and sometimes limited capability for work, driving or sports. It is a common misconception that strabismus is a exclusively a childhood disease, but it is a common problem in adult population,

approximately 4% of patients older than 15 years have strabismus (1,2,3,4).

Adult patients hardly make a decision for operation because they think they are either too old or they think that operation will make their condition more difficult, especially if patients have strabismus since childhood (1,2,3).

There are two forms of strabismus in adult patients. The first form is strabismus since childhood which has not been treated or the treatment was unsuccessful. Certain forms of uncompensated phorias fall into this group. Some patients have good visual function, but they also have problems with binocular vision and some patients have amblyopia since childhood, in these cases it is important to emphasize that operation will not improve vision, but

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will only correct position of eyes. The second form is seen in adult age with multiple reasons such as trauma, stroke, thyroid orbitopathy, cranial nerve palsy, orbit and eye surgery. In these cases it is important to cure the primary disease (1,2,3,4,5,6).

Strabismus treatment can be conservative and surgical. Conservative treatment includes prisms and orthoptic exercises and most of adult patients decide for this kind of treatment and botulinum toxin as well. Surgical treatment is indicated because of cosmetic and function: better appearance, fusion and stereopsis reparation, asthenopic problems, convergence improvement, elimination of diplopia or correction of ocular torticollis. Strabismus surgery is easier when patients are than children for the surgeon, because it does not have to be performed in general anaesthesia, it can be done in local anaesthesia, there are no parents demands and finally, the result is evident right after the surgery and the physician does not have to wait for patient to grow up and operator has more freedom for recession and resection of the muscles (2,3,4).

The postoperative recovery is relatively short, only a few days and after that patients can return to their everyday activities. There is always a chance for a repeated procedure in case the patient is not satisfied. Patient must always get an explanation of benefits and risks of procedure. Adult patients with chronic strabismus have been thought to have the potential to achieve only a cosmetic result from surgery. On the contrary, several studies have shown that unexpected sensory fusion is possible after excellent postoperative motor alignment in these patients (5,6,7,8,9). Other functional benefits of strabismus surgery in the adult patient include the expansion of binocular visual fields in patients with esotropia and the psychosocial and economic benefits from restoration of ocular alignment (2). Potential risks are postoperative acquired diplopia, loss of fusion and repeated surgeries (1,2,3).

**Table 1.** Type of strabismus and amblyopia present in adult patients

Type of strabismus & Amblyopia present	Eye affected by amblyopia	
	N	(%)
Esotropia	11	31,4
Exotropia	17	48,6
Hypertropia	7	20,0
Total	35	100,0

  

Eye	N (%)	
	N	(%)
Left eye	21	60%
Right eye	14	40%
Total	35	100%

Most common indication for operative procedure was aesthetics, total of 28 cases (80,0%). Table 2.

## PATIENTS AND METHODS

A retrospective chart review of all adult patients who had undergone strabismus surgery between January 2016 and May 2018 was performed. Patient selection criteria were adult patients with untreated or uncompleted treatment strabismus in childhood, other forms of strabismus we excluded. Final measurements were, on average, taken at 3 to 6 weeks postoperatively. These patients were consented to be included in the study, in accordance to the Helsinki Convention. Patients were asked to comment subjectively on their surgical outcome as very satisfied, satisfied, neutral, unsatisfied, or very dissatisfied. All of patients preoperative were evaluated with cover test, motility, convergence, preoperative and postoperative angle deviation with prisms dioptres (PD), fusion, stereopsis preoperative and postoperative with Titmus stereo testing, Prism adaptation testing and diplopia testing by Hess-Lancaster test. Statistic analysis is demonstrated with tables and charts, a descriptive statistical method including absolute and relative number of cases, mean value with standard deviation, median and interquartile range. Analysis was done using the statistical program for biomedical research MedCalc v 12.7 (Antwerp, Belgium).

## RESULTS

In total 35 (N=35) patients were included, 12 (34,3%) patients were male and 23 (65,7%) were female patients. Mean age was 34,5±13 years (20-67 years). Central tendency analysis shows that most patients were 23 to 42 years old (50%) with median age of 32 years.

Exotropia 17 ( 48,6% ) was more frequent than esotropia 11 ( 31,4% ), and hypertropia 7 (20%) cases. Amblyopia was present in 16 (45,7%) cases, amblyopia was also more frequent on the left eye in 21 cases (60% ).Table 1.

**Table 2.** Indication for adult strabismus surgery

Indication for surgery	N	%
Asthenopia	1	2,86
Torticolis	4	11,43
Diplopia	2	5,71
Aesthetic/psychological	28	80,0
Total	35	100,0

**Table 3.** Preoperative and postoperative angle deviation measurements & Stereopsis**Preoperative & postoperative angle value & Stereopsis**

	Preoperative angle	Postoperative angle
Mean value	20,51	2,13
Std. Error of mean value	2,01	0,39
Std. Deviation	11,86	2,25
Minimum	5,00	0,50
Maximum	50,00	12,00
<b>Stereovision Yes</b>		22
<b>Stereovision No</b>		10
<b>Postoperative diplopia</b>		3
<b>Total</b>		35

Most patients were satisfied 17 (48,6%) or very satisfied 13 (37,1%), so the total number of satisfied patients was 30 (85,7%), 3 (8,6%) patients were neutral and 2 (5,7%) patients were unsatisfied. Table 4.

**Table 4.** Postoperative patients satisfaction

Patinets satisfaction	N
Very satisfied	13
Satisfied	17
Neutral	3
Unsatisfied	2
Total	35

Repeated procedure was performed in 2 (5,71%) cases which is also considered a good result.

**DISCUSSION**

In this retrospective study we observe a total of 35 patients were included, 12 (34,3%) patients were male and 23 (65,7%) were female, Mean age was 34,5±13 years (20-67 years).

A relatively small number of cases is because most of adult patients find it difficult to make a decision whether they should have surgery or not, but the fact is that a certain number of adult strabismus were treated

Success rate was defined as an alignment that was within 10 prism diopters of straight with no subjective symptoms of diplopia or visual confusion after one strabismus surgical procedure, good stereopsis (40 to 60 seconds of arc) and patient satisfaction.

Preoperative angle mean value was 20,5±11,9° (5°-50°), postoperative angle mean value was 2,1±2,25° (0,5°-12°), meaning that average reduction of angle was 18,6±11,4° (4°-48,5°). Postoperative angle nearest to 0° (±4-5° or 5 - 10 PD) was present in 31 (88,6%) cases and 4 (11,43%) cases had postoperative angle larger than 5° or 10 PD. Table 3.

conservatively with orthoptics exercises or with prisms.

Exotropia 17 (48,6%) was more frequent than esotropia 11 (31,4%), and hypertropia 7 (20%) cases. Amblyopia was present in 16 (45,7%) cases, amblyopia was also more frequent on the left eye in 21 cases (60%). Most common indication for operative procedure was aesthetics, total of 28 cases (80,0%). Success rate was defined by multiple factors like orthophoria or angle near close to 0°, binocular vision or stereopsis and patient satisfaction. Orthophoria or postoperative angle near to 0° (±4-5° or 5-10 prism diopters) was present in 31 (88,6%) cases and 4 (11,43%) cases had postoperative angle larger than 5° or 10 prism diopters. Preoperative angle mean value was 20,5±11,9° (5°-50°), postoperative angle mean value was 2,1±2,25° (0,5°-12°), meaning that average reduction of angle was 18,6±11,4° (4°-48,5°). Most patients were satisfied 17 (48,6%) or very satisfied 13 (37,1%), so the total number of satisfied patients was 30 (85,7%), 3 (8,6%) patients were neutral and 2 (5,7%) patients were unsatisfied.

Repeated procedure was performed in 2 (5,71%) cases which is also considered a good result.

Strabismus surgery in adults achieves satisfactory alignment with one operation in approximately 80% of patients, depending on the specific nature of the problem (1). As previously stated, approximately 20% of adults will need more than one surgical procedure to attain ocular alignment within 10 PD of straight, depending on the nature of their strabismus (1,2).

Trent M.Sandercoc and all described surgical audit

was performed on 91 adult patients, by a singular surgeon. Final measurements, on average, were taken at 16 weeks postoperatively, and patients were asked to comment subjectively on their outcome. The majority of patients were seeking surgery for combined psychosocial and cosmetic reasons (78.4%), or combined psychosocial and functional indications (9.6%), whereas the remainder were seeking surgery for functional indications only. 83% of patients reached the desired surgical outcome of <10 prism dioptres; 97.6% were satisfied or very satisfied with their surgery, with the remaining patients having a neutral standpoint, and none were dissatisfied. Finally, Adult strabismus surgery is highly successful and provides patients with a good level of satisfaction. Many patients seek surgical correction for cosmesis and psychosocial benefits (10).

**Mills** et al. focused on success after one surgical procedure. However, if any patient who is not satisfactorily aligned after one operation achieves successful alignment with a reoperation, it would seem axiomatic that the overall success rate of strabismus surgery would be even higher if one considered the results of a secondary surgery. In of 200 patients described 26 patients (17%) were not satisfactorily aligned after one operation. Twenty-one of the 26 elected to have secondary surgery after which 19 (73% of the 26) achieved a successful outcome for an overall success rate of 97% after one or two operations (11).

**Scott** reported a series of 892 patients he operated on and separately analyzed the 492 whose strabismus began before visual maturation, 312 whose onset was after visual maturation and 119 with complex forms of strabismus (paralytic strabismus, Brown syndrome, Duane syndrome, and dissociated vertical deviation). Scott's outcome criteria for success were different in the three groups. Patients in the first group were primarily undergoing surgery for the purpose of improving cosmesis; for this group, he had two outcome criteria for success. One was 15 PD or less of tropia, which Scott took to represent a satisfactory cosmetic outcome, and also 8 PD or less of tropia and 60% patients satisfaction, which would permit development of the monofixation syndrome (12).

**Monte D Mills** and all describe the effectiveness and safety of surgical treatment of adult patients with strabismus, and to review the reported functional benefits and complications of strabismus surgery for adults. Several large case series of adults with strabismus with successful surgical realignment rates of 68% to 85% have been reported. Functional benefits of surgical treatment are reported in many patients. These include elimination of diplopia, development of binocular fusion, expansion of binocular visual fields, and improvement of head position. Surgical complications, including new, postoperative diplopia (1%–14%) or scleral perforation (0.8%–1.8%), occur in a minority of patients. Unplanned reoperations (subsequent strabismus procedures that were not anticipated as part of a staged treatment) were needed in up to 21% of patients in large case series of comitant strabismus, and in up to 50% of patients with thyroid

ophthalmopathy. Conclusions; surgical treatment of adults with strabismus is safe and effective in improving ocular alignment. Risks include unplanned reoperation, postoperative diplopia, and scleral perforation (13).

**Brianna Volk** and all show psychosocial benefits of strabismus surgery as reported from postoperative patient of the 58 participating patients, 51 (87.9%) patients indicated positive postoperative satisfactory score; 4 (6.9%) patients indicated negative PSS scores; and 3 (5.2%) patients indicated PSS scores of zero, each of which were mentioned by at least 28 (48.3%) patients. Preoperatively 39 (67.2%) patients mentioned being self-conscious while postoperatively 3 (5.1%) patients remained concerned with self-consciousness. Similarly, preoperatively 36 (62.1%) patients expressed concern with their eye misalignments while postoperatively eye misalignment was a concern addressed by 3 (5.1%) patients. Conclusions; Strabismus surgery benefits adult patients in many aspects including: double vision, depth perception, self-consciousness, peripheral vision, reading, head tilting, blurry vision, and eye misalignment. There is a significant psychosocial benefit in strabismus surgery (14).

**Hertle** described his results in 255 patients and reported successful alignment in 85% of them in series also included a heterogeneous patient mix with a large number having incomitant strabismus, vertical deviations, or multiplanar deviations (vertical and horizontal) (15).

## CONCLUSION

Strabismus surgery are not exclusive for children only, they are safe and certain for adults as well, despite of age. This kind of surgeries have a very functional benefit, which includes reconstruction and restoration of motoric relations and binocularity, extension of the monocular and binocular visual field, and provide esthetic and psychological benefit. Work with adults gives a great personal satisfaction, because adult patients who get their strabismus treated were some of the happiest and most grateful patients.

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