Original Article

The Outcome of Strabismus Surgery and Influencing of Surgical Success at Children Surgical Center, Cambodia

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Abstract

Introduction: *Strabismus is a condition in which the eyes are not properly aligned with each other. It may be accompanied by abnormal motility of one or both eyes with multifactorial factors including both genetic and environmental. A surgical treatment is one of the options.*

Objective*: To determine the outcome of surgery treatment of strabismus patients.*

Methods: *It was a cross sectional study conducted in Department of Ophthalmology at Children's surgical center that located in Kien Khleing National Rehabilitation Center, Phnom Penh, Cambodia from January 2009 to October 2014 with the sample size of 269 cases. All surgeries were conducted under general anesthesia, following routine pediatric techniques. Horizontal squint surgery was performed as the first surgery, using standard surgical dosage tables without modification.*

Results: *There were totally 269 strabismus cases consisting 34% male and 66% female found in this study. 91.82% of the cases were seen in the age group from 0-9 years. 59% of cases were considered as congenital (onset before 6 months old) against 41% of acquired strabismus (onset after 6 months old). 92% of the cases were treated by horizontal surgery whereas other 4% were vertical squint (2%) and torsional (2%). There were 68% of cases had orthotropia (fully corrected), 24% had undercorrected esotropia, 6% had undercorrected exotropia and 2% had overcorrected. The Majority of cases had successful surgery treatment without complication. However, there were some complication seen such as 1% of diplopia, 2% of re-operation and 0.37% of scleral perforation.*

Conclusion: *In conclusion to this study, we found that strabismus was affected in female more than male. Children from 0-9 years old are the most commonly seen in term of age. There was highest number of cases recorded from Kampong Cham province than other provinces. There were 96% of had surgery treatment and got better outcome and the complication was noted in just 3.5% of cases.*

Keywords: *Strabismus, esotropia, exotropia, Horizontal surgery, Complication*

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Introduction

Strabismus is a condition in which the eyes are not properly aligned with each other. Approximately 2-4% of children[1] and as many as 4% of the adult population are affected by strabismus.[2] Strabismus can be caused from sensory, motor, or innervational factors.

Strabismus can happened any time in life, but most commonly in early childhood.[3] Congenital or infantile strabismus develops during the first six months of life. Strabismus onset after six months is referred to as childhood onset strabismus. Onset in adulthood is usually considered an acquired strabismus. Risk factors for developing strabismus include retinopathy of prematurity, mother smoking during pregnancy, low birth weight, and family history.[4] The hereditary factor was observed in the higher percentage of strabismus in children whose family members have strabismus, 17-30%.[5]

The exact causative gene remains unclear at this time. The heritability of strabismus is also demonstrated in twin study. One study analyzed a large sample of monozygotic and dizygotic twins resulted in a 64% heritability of esotropia, whereas exotropia is caused mostly by environmental factors.[6] They also showed that the heritability of esotropia is independent of refractive error. People with strabismus may experience double vision, eyestrain, vision loss, and poor depth perception, as well as cosmetic issues, which is the most upset part of them.[7] The present study aimed to determine the outcome of surgery treatment of strabismus patients.

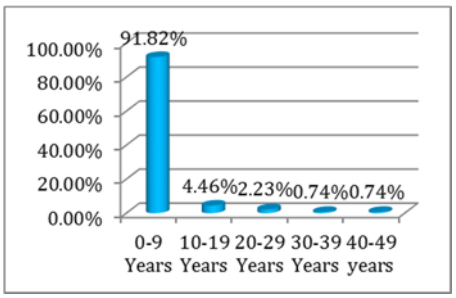
Methods

It was a cross sectional study, conducted in Department of Ophthalmology, Children's surgical center, Phnom Penh, Cambodia from January 2009 to October 2014 with the total population of 269, age ranged from 3 months to 40 years old. All patients underwent eye examination starting from VA (in subjects that we can take) until fundus examination. Regarding strabismus test, Hirschberg test was used to rule out pseudostrabismus then the cover/uncover test was performed to rule out another phoria. ACT w/Prism Diopter both near and distant was performed in case of good VA patient. Modified Krimski using Prism and light reflex was used in small kids or patients who has poor vision. All data were analyzed using Microsoft Excel-2010. The results were obtained as percentage (%), and presented as tables and graphs.

Results

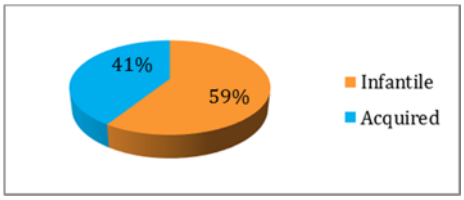
There were totally 269 strabismus cases consisting of 91 (34%) male and 178 (66%) female. This result clearly shows that the female sex was affected more than male. The highest number of cases (91.82%) belongs to 0-9 year's age groups. There were 4.46% cases in 10-19 years, 2.23% in 20-29 years, 0.74% in 30-39 years and 0.74% in 40-49 years old age groups.

Figure 1. Distribution of strabismus by age groups



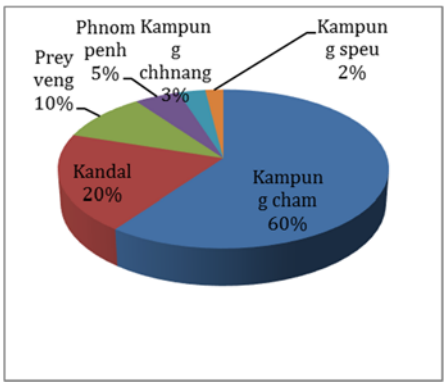
There were 59% of cases were infantile strabismus and 41% of cases acquired strabismus. This results clearly shows that the maximum number of cases got strabismus by birth.

Figure 2. Distribution of infantile and acquired strabismus



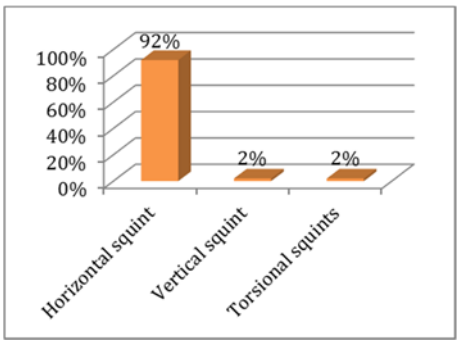
There were 60% of cases belong to kampong Cham province which was very high than any other regions.

Figure 3. Distribution of strabismus based on region



There were 92% of cases treated by horizontal squint, which was the most preferable surgery treatment than other types like vertical squint (2%) and torsional (2%).

Figure 4. Surgery treatment of strabismus



There was less number of strabismus cases had undergone non-surgical treatment such as 3% had Amblyopia and 1% had Spectacles.

Table 1. Non-surgical treatment of strabismus

Type of Non-surgical	Number	Percentage
Amblyopia	8	3%
Spectacles	3	1%
Total	11	4%%

For treatment outcome, there were 68% of cases had orthotropia (fully corrected), 24% had under-corrected estropia, 6% had undercorrected extropia and 2% had overcorrected.

Table 2. Treatment outcomes of strabismus

Treatment outcome	Number	Percentage
Orthotropia (fully corrected)	183	68%
Undercorrected Esotropia (ET)	65	24%
Undercorrected Exotropia (XT)	16	6%
Overcorrected (ET XT)	5	2%
Total	269	100%

There were few cases had complications such as 1% of diplopia, 2% of re-operation and 0.37% of scleral perforation.

Table 3. Complication after treatment

Complications	Number	Percentage
Diplopia	3	1%
Re-operation	6	2%
Scleral perforation	1	0.37%

Discussion

The present study found totally 269 strabismus cases including 91 (34%) male and 178 (66%) female subjects, which clearly show, the female gender mostly affected than male gender. The similar findings were reported from Tanaka A *et al.*[8] Another study from Kenyatta National Hospital found both male and female patients were nearly equal.[9] The role of heredity, prenatal, and parental factors had been studied by Aichmer H *et al.* in the development of strabismus in 42 patients (male : female ratio 0.8:1) with primary concomitant strabismus, and four patients

with secondary strabismus.[10] A study from Faghihi M *et al.*, found that the prevalence of strabismus in the students was 2%. Of female and male students, 2.4% and 1.4% had strabismus, respectively (P=0.160). Of the students with strabismus, 67.7%, 25.8% and 6% had exotropia, esotropia and vertical deviations, respectively.[11]

The prevalence of strabismus in young Singaporean Chinese children aged 6 to 72 months was 0.80% (95%CI 0.51-1.19), with the prevalence of exotropia and esotropia being 0.70% (95%CI 0.41-1.03) and 0.10% (95%CI 0.002-0.29) respectively.[12] MEPED study found the prevalence of strabismus among 6 to 72 month old Hispanic/Latino - African American children was 2.4% and 2.5% respectively.[13] BPEDS study found that the age between 6 to 72 months old - African American and white, the prevalence of Strabismus was 2.1% and 3.3% respectively.[14] Pathai *et al.* (2010) reported 2.1% of strabismus found in children aged between 3-5 year old.15 Chia *et al.*, (2010) reported that the age between 6-72 months old children, the prevalence of Strabismus was 0.8%.

The present study found that there was 59% of cases were infantile strabismus and 41% of cases were acquired. Some studies reveal that infantile esotropia is not congenital and most likely develops between age 2 and 4 months old, a duration which most infants are becoming orthotropic. It was also reported that the development of constant exotropia in a neurologically normal child 6 months of age. The accommodative esotropia has an average age of onset of 2 ½ years (a range of 1 to 8 years) however; cases have been documented prior to age 1. One-third of all children with esotropia become well aligned when wearing an optical correction for hyperopia, and another one third obtain significant but not complete reduction of the esotropia.

The present study found, there was 96% of strabismus cases had surgery treatment and just 4% of cases had non-surgery treatment. Dotan G reported that the most common surgery was a recession-resection.9 The recent study found that surgery on one eye was more effective (82% success) than surgery on both eyes (52% success).[12]

The present study found that there was 68% of cases had orthotropia, 24% had undercorrected estropia, 6 % had undercorrected extropia and 2 % had overcorrected. The previous study found that the success rate was 62.0% for esotropia and 57.0% for exotropia. There was no statistical difference between the two groups of diagnosis.[9]

Regarding the visual acuity, it was not statistical significance between pre- and post-op. The complication rate was seen 0.7% including conjunctival wound dehiscence and globe perforation. Sencond surgery was 12.9% (39/304) after one year.[16]

A retrospective analysis of 15 consecutive cases in children with Down syndrome who underwent surgery for strabismus, the surgical success (within 10 Delta of orthophoria) was achieved in 85.7%. The remaining 2 children (14.3%) had residual esotropia.[17]

A study from Nepal Eye Hospital, Tripureshwor, Kathmandu reported that female gender was affected more than male. After surgery a total of 40 patients underwent strabismus surgery, fully corrected achieved only in 22.5%, 2-8 prism diopters in 55% and 10-15 prism diopters in 22.5%.[18]

A retrospective reviewed the patients with secondary strabismus from myelomeningocele; who underwent surgery for correction in an institution for disabled children for 5 years; esotropia and A-pattern anisotropia was considered as the main indications for surgery. Excellent surgical outcomes were achieved in 60.9% of patients, satisfactory in 12.2%, and unsatisfactory in 26.9%.[19]

Binocular single vision and stereopsis can be restored during the period of cortical plasticity in children after strabismus surgery. Caputo R *et al.* reported an improvement in 35% of children with congenital esotropia after early surgery.[20] An unexpected sensory fusion is possible after excellent postoperative motor alignment in adult patient.[21] Apart from cosmetic, the restoration of binocular fusion and elimination of diplopia, expansion of binocular visual field in patient with esotropia and improvement in psychsocial function are also the most important reason to correct strabismus.[22]

A study by Kushner & Morton, a report of surgery for long-standing constant strabismus, 86% of patient showed binocular response with the Bagolini lens test almost immediately after surgery.[23] According to Thomas Satish, a good surgical outcome of large-angle strabismus can be corrected with a single surgical procedure.[24] Preoperative deviation and refractive errors were proved to be significant factors influencing a favorable outcome in patients with exotropia.[25]

In a study by Mets MB, the outcome of surgical correction in adults' strabismus includes the improvement in binocular function; it was seen in 42% of the patients.[26] Chan TY *et al.* reported that some degrees of stereopsis could be achieved in most cases even after delayed alignment in patients with infantile or early strabismus.[27] However, the study by Sabina Shrestha *et al.*, binocular single vision improved in only 3% of cases. The contributing factors for the same may be firstly, age less than 8 was only in three cases; secondly, anterior segment was abnormal in 12% right eyes and 15% left eyes and posterior segment was abnormal in 10% right eyes and 15 % left eyes.[18]

Conclusion

The strabismus was higher among female (66%) than male (34%) subjects. The highest number of subjects (91.82%) belongs to 0-9 year's age groups. The infantile strabismus consisting of 59% whereas acquired strabismus belong to 41%. There was 60% of strabismus cases belong to kampong Cham that was higher than other regions. There were 92% of strabismus cases treated by horizontal squint which was the most preferable surgery treatment than other types like vertical squint (2%) and torsional (2%). The less number of strabismus cases had undergone non-surgical treatment such as 3 % had Amblyopia and 1 % had Spectacles. There were 68% of cases had orthotropia – fully corrected, 24% had undercorrected estropia, 6 % had undercorrected extropia and 2 % had overcorrected. Majority of strabismus cases had successful surgery treatment without any complication. But there were few cases had complication such as 1% of diplopia, 2% of re-operation and 0.37% of scleral perforation.

Recommendation

The strabismus was seen more common in female gender. We suggest the physician and researcher to further investigate the associated factors contributing to female gender.

The present study found infantile strabismus slight higher than acquired strabismus; hence we suggest the physician to evaluate pregnancy and checking necessary tests related to pregnancy.

Conflict of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

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