

The clinical characteristics of pediatric strabismus in Ho Chi Minh City Eye Hospital in 2020

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Background: Pediatric strabismus is a common disorder that may lead to a severe decrease in visual quality. Updating the changes in disease characteristics through time is important for the diagnosis and prognostication of pediatric strabismus.

Methods: Retrospective cross-sectional study. Medical records of 1,101 patients with the diagnosis of pediatric strabismus from January 1st, 2020 to December 31st, 2020 were enrolled in this study. The medical records are included if sufficient information is available.

Results: We included 1,101 medical records in 2020. The prevalence of exotropia, esotropia and vertical strabismus were, in order, 68.4%, 29.3% and 2.3%. The prevalence of alternating strabismus and monocular strabismus were, in order, 74.8% and 25.2%. The prevalence of intermittent strabismus and manifest strabismus were, in order, 65.9% and 34.1%. Refractive errors exist in 87.3% of patients. Visual acuity could be recorded in 51.5% of patients, in which 31.8% of patients had a severe decrease of visual acuity (< 2/20). Amblyopia was recorded in 34% of patients, with 68.2% of whom from esotropia. Correcting refractive errors was the main treatment procedure (60.7%).

Conclusion: Pediatric strabismus may affect the children's visual acuity deeply and therefore affect their quality of life. Early diagnosis of the disease takes the decisive role in preventing patients from amblyopia. As a large number of patients have refractive errors, early screening of the patient's refraction is also mandatory.

Conflicts of interest: The authors declare no conflict of interest.

Keywords: Amblyopia, pediatric, refractive errors, strabismus, visual acuity.

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Introduction

Pediatric strabismus is a common disorder in children, with the prevalence from 2-6% according to various studies.¹⁻³ As disease progression is not acute, pediatric strabismus is usually overlooked, hence delaying the diagnosis and treatment as well as leading to a worse

prognosis. Pediatric strabismus is a challenging disorder; not only affecting the children's visual acuity, this disorder also results in abnormality in their appearance, which may affect their quality of life, mentality and career opportunities in many years ahead. In different regions, the prevalence and clinical characteristics of pediatric strabismus seem to differ.⁴⁻⁶ Therefore, archiving a thorough and updated understanding about the disease is essential to optimize the results of clinical practice.

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Materials and methods

This study was conducted with the approval of the Human Ethics Committee of School of Medicine, Vietnam National University – Ho Chi Minh City and was performed according to the tenets of the Declaration of Helsinki. This was a retrospective cross-sectional study. Data from 1101 medical documents of pediatric patients diagnosed with strabismus from January 2020 to December 2020 in Ho Chi Minh City Eye Hospital were recorded. The inclusion criteria were medical documents of patients younger than 16 years old, with the diagnosis of pediatric strabismus and had sufficient information recorded. Medical documents with insufficient information or not in 2020 were excluded from our study.

Data collected included patients age, sex, location, history of pre-term birth or refractive errors in family, clinical characteristics of strabismus (degree of strabismus; exotropia, esotropia or vertical strabismus; alternating or monocular strabismus; intermittent or manifest

strabismus), refractive errors, visual acuity, visual defects (amblyopia, loss of binocular vision, loss of convergence), types of treatment and loss of follow-up.

Data was analyzed with SPSS 20 software, with quantitative variables presented with mean \pm standard deviation (SD) and qualitative variables presented with several percent. The relation between 2 qualitative variables was confirmed by the chi-squared test. The difference was considered as being statistically significant with $P \leq 0.05$.

Results

The details about age, sex, location, related medical histories and age of disease discovery were summarized in Table 1. Most patients were from 2 – younger than 5 years of age and the male-to-female ratio of all patients was 0.7:1. There were 35.5% of patients from Ho Chi Minh City and 64.5% of patients from all other regions of Vietnam.

Table 1: Epidemiological characteristics and related medical history

| Epidemiological characteristics | N | Percent (%) |
|---------------------------------|-----|-------------|
| Age | | |
| 0 - <2 | 171 | 15.5 |
| 2 - <5 | 478 | 43.4 |
| 5 - <16 | 452 | 41.1 |
| Sex | | |
| Male | 454 | 41.2 |
| Female | 647 | 58.8 |
| Location | | |
| Ho Chi Minh City | 391 | 35.5 |
| Other southern provinces | 509 | 46.3 |
| Central highlands/provinces | 194 | 17.6 |
| Northern provinces | 7 | 0.6 |
| Medical history | | |
| Pre-term birth | 177 | 16.1 |
| Refractive errors (family) | 208 | 18.9 |

The clinical characteristics of all patients were summarized in Table 2. Most patients had 15-degree strabismus using the Hirschberg test. A majority of patients (68.4%) had exotropia while only 2.3% had vertical strabismus. Alternating strabismus (74.8%) and intermittent strabismus (65.9%) were dominant compared to monocular strabismus and manifest strabismus, in order. Most of the patients (87.3%) had refractive errors; 12 patients were too small to confirm whether or not they had refractive errors. There

were 49 patients (8.6%) with poor visual acuity that can affect daily life activities. There were 34% of patients diagnosed with amblyopia and 2% of patients (0.2%) with loss of binocular vision. In the amblyopia cases, 68% of patients had esotropia compared to exotropia and/or vertical strabismus (chi-square = 22.9, $P < 0.05$). In other aspects, 39.6% of monocular strabismus had amblyopia while 32.1% of alternating strabismus had amblyopia (chi-square = 4.86, $P < 0.05$).

Table 2: Clinical characteristics of pediatric strabismus

| Clinical characteristics | N | Percent (%) |
|--------------------------|-----|-------------|
| Degree of strabismus | | |
| 7° | 108 | 9.8 |
| 15° | 733 | 66.5 |
| 20° | 255 | 23.2 |
| >20° | 5 | 0.5 |
| Exotropia | 753 | 68.4 |
| Esotropia | 323 | 29.3 |
| Vertical strabismus | 25 | 2.3 |
| Monocular strabismus | 278 | 25.2 |
| Alternating strabismus | 823 | 74.8 |
| Intermittent strabismus | 726 | 65.9 |
| Manifest strabismus | 375 | 34.1 |
| Refractive errors | | |
| Yes | 961 | 87.3 |
| No | 128 | 11.6 |
| N/A | 12 | 1.1 |
| Visual acuity (n = 567) | | |
| ≥12/20 | 272 | 48 |
| 6/20 – 10/20 | 115 | 20.3 |
| 2/20 – 4/20 | 131 | 23.1 |
| <2/20 | 49 | 8.6 |
| Visual defect | | |
| Amblyopia | 374 | 34 |
| Loss of binocular vision | 2 | 0.2 |

The treatment characteristics of pediatric strabismus were listed in Table 3. Correction of refractive errors was the main treatment procedure (63.3%). Most patients (59%) had 1 treatment procedure (wearing eye glasses); there

were 36.7% of patients who underwent further observation without any intervention. Finally, loss of follow-up happened in a majority of patients (54%).

Table 3: Treatment characteristics of pediatric strabismus

| Treatment characteristics | N | Percent (%) |
|---------------------------------|-----|-------------|
| Treatment procedure | | |
| Correction of refraction | 697 | 63.3 |
| Surgery | 2 | 0.2 |
| Amblyopia exercise | 29 | 2.6 |
| Muscle exercise | 16 | 1.5 |
| Observation | 404 | 36.7 |
| Combination of treatment | | |
| Observation | 404 | 36.7 |
| 1 procedure | 650 | 59 |
| 2 procedures or more | 47 | 4.3 |
| Loss of follow-up | | |
| Yes | 595 | 54% |
| No | 506 | 46% |

Discussion

As described in Table 1, most of the patients were ≥ 2 years old; the discovery of strabismus may be the result of the child attending school and was found out by other adults. Particularly, 41.4% of patients were 5 years old or older; this late diagnosis may affect binocular vision as this function was refined before the age of 6.⁷ The prevalence of female patients seemed to be higher than male patients; however, Achim⁸ found that there was no difference in prevalence between males and female. We found that 64.5% of patients were from other regions than Ho Chi Minh City, as well as 81.8% of patients were from southern regions; therefore, it could be assumed that Ho Chi Minh City Eye Hospital carried a heavy burden in providing ophthalmic healthcare for people on southern regions, and even on the whole country. As concluded by other authors⁹⁻¹⁰, we also found that pre-term birth and family history of refractive errors were the conditions frequently associated with pediatric strabismus.

In terms of the degree of strabismus, most of the patients had 15-degree strabismus, which

was not difficult to perform operation, in case surgical intervention was required. In terms of clinical characteristics, the most frequent signs found in the patients were exotropia (68.4%), alternating strabismus (74.8%) and intermittent strabismus (65.9%). These findings were similar to other authors; Chen¹¹ and Audrey Chia¹² concluded that the prevalence of exotropia was higher than esotropia, Ahmed¹³ stated that 82.8% of patients had alternating strabismus and the study of Hui Zhu¹⁴ demonstrated that intermittent strabismus was more frequent than manifest strabismus. Our study found that a majority of pediatric strabismus patients had refractive errors; this finding is similar to various studies^{14,15} that refractive errors had a high prevalence, with the most frequent one being myopia. It could be assumed that exotropia was related to myopia, which was the main refractive error in children. Fortunately, according to the authors¹¹⁻¹⁴, exotropia, alternating strabismus and intermittent strabismus were associated with good prognosis in visual acuity. As described earlier in Table 2, only 8.6% of patients had visual acuity $<2/20$ and 2 patients lost binocular

vision while the prevalence of amblyopia was 34%. We also found that patients with esotropia and monocular strabismus had a higher tendency towards developing amblyopia. This finding could be explained that patients with esotropia and monocular strabismus had more difficulty in using binocular vision, which led to the reaction of the brain to deny the image from the eye with strabismus, which usually had lower visual acuity than the normal eye.¹⁶

Table 3 describes the treatment characteristics of pediatric strabismus. The most frequent treatment was wearing eye glasses. As most strabismus patients were associated with refractive errors, the strabismus itself resolved when the refractive error was corrected. Therefore, screening for refractive errors had an essential role in treatment and follow-up check of pediatric strabismus patients. Of all patients who underwent treatment, 100% of patients had correction of refractive errors. Using eye glasses alone was enough for 650/697 patients and only 47 patients needed an additional treatment. Finally, loss of follow-up happened in 54% of patients. This mainly came from the fact that treatment and follow-up of pediatric strabismus was a long-term treatment, causing considerable difficulties for the patients and their families.

Conclusion

This study's findings indicate that pediatric strabismus is a common disorder that may affect the children's visual acuity deeply and therefore affect their quality of life. Early diagnosis of the disease takes the decisive role in preventing the patients from amblyopia. As a large number of patients have refractive errors, early screening of the patient's refraction is also a mandatory part of clinical examination.

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References

1. Sharma P, Gaur N, Phuljhele S, Saxena R. What's new for us in strabismus? *Indian J Ophthalmol.* 2017;65(3):184-90.
2. Hashemi H, Yekta A, Jafarzadehpur E, Ostadimoghaddam H, Eshrati B, Mohazzab-Torabi S, et al. The prevalence of strabismus in 7-year-old schoolchildren in Iran. *Strabismus.* 2015;23(1):1-7.
3. Torp-Pedersen T, Boyd HA, Skotte L, Haargaard B, Wohlfahrt J, Holmes JM, et al. Strabismus Incidence in a Danish Population-Based Cohort of Children. *JAMA ophthalmology.* 2017;135(10):1047-53.
4. Rosman M, Wong TY, Koh CL, Tan DT. Prevalence and causes of amblyopia in a population-based study of young adult men in Singapore. *American journal of ophthalmology.* 2005;140(3):551-2.
5. Chew E, Remaley NA, Tamboli A, Zhao J, Podgor MJ, Klebanoff M. Risk factors for esotropia and exotropia. *Archives of ophthalmology (Chicago, Ill : 1960).* 1994;112(10):1349-55.
6. Matsuo T, Matsuo C. The prevalence of strabismus and amblyopia in Japanese elementary school children. *Ophthalmic epidemiology.* 2005;12(1):31-6.
7. Feinberg DL, Rosner MS, Rosner AJ. Validation of the Binocular Vision Dysfunction Questionnaire (BVDQ). *Otol Neurotol.* 2021 Jan;42(1):e66-e74.
8. Fieß A, Kölb-Keerl R, Schuster AK, Knuf M, Kirchhof B, Muether PS, et al. Prevalence and associated factors of strabismus in former preterm and full-term infants between 4 and 10 Years of age. *BMC Ophthalmology.* 2017;17(1):228.
9. VanderVeen DK, Allred EN, Wallace DK, Leviton A. Strabismus at Age 2 Years in Children Born Before 28 Weeks' Gestation: Antecedents and Correlates. *Journal of child neurology.* 2016;31(4):451-60.
10. Onua A. Risk Factors of Strabismus in Children in a Southern Nigerian Tertiary Hospital. *World Journal of Ophthalmology & Vision Research.* 2019; 2(4):2641.
11. Chen D, Li R, Li X, Huang D, Wang Y, Zhao X, et al. Prevalence, incidence and risk factors of strabismus in a Chinese population-based cohort of preschool children: the Nanjing Eye Study. *The British journal of ophthalmology.* 2021;105(9):1203-10.

12. Chia A, Dirani M, Chan YH, Gazzard G, Au Eong KG, Selvaraj P, et al. Prevalence of amblyopia and strabismus in young singaporean chinese children. *Investigative ophthalmology & visual science*. 2010;51(7):3411-7.
13. Qanat AS, Alsuheili A, Alzahrani AM, Faydhi AA, Albadri A, Alhibshi N. Assessment of Different Types of Strabismus Among Pediatric Patients in a Tertiary Hospital in Jeddah. *Cureus*. 2020;12(12):e11978.
14. Zhu H, Pan C, Sun Q, Huang D, Fu Z, Wang J, et al. Prevalence of amblyopia and strabismus in Hani school children in rural southwest China: a cross-sectional study. *BMJ open*. 2019;9(2):e025441.
15. Agaje BG, Delelegne D, Abera E, Desta K, Girum M, Mossie M, et al. Strabismus prevalence and associated factors among pediatric patients in southern Ethiopia: a cross-sectional study. *The Journal of international medical research*. 2020;48(10):300060520964339.
16. Tailor V, Bossi M, Greenwood JA, Dahlmann-Noor A. Childhood amblyopia: current management and new trends. *Br Med Bull*. 2016;119(1):75-86.