

# Concomitant Child Strabismus: Clinical Forms and Treatment

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**Abstract:** *Aim:* To describe the different clinical forms of concomitant strabismus and the results of treatment. *Patients and methods:* Descriptive retrospective study conducted from January 2007 to December 2017 (10 years), on records children with strabismic, aged 1 to 16 in the department of Ophthalmology of the University Hospital of Brazzaville. *Results:* Of the 7,722 children collected during the study period, 130 had strabismus, a rate of 1.7%. Forty three (43%) children were boys and 74 (57%) were girls with a sex ratio of 0.75. The average age of the first consultation was  $9.3 \pm 3.2$  years old (1 to 16). The age group of 2-6 years old was the most represented with 43.9% of patients. Depending on the type of strabismus we found as many convergent as divergent strabismus which affects both girls and boys. There was 72.3% monocular strabismus and 27.7% alternation. Dominance was greater on the right, 30.7% and 15.4% dominance on the left. The majority of patients had an initial angle  $\geq 25$  prismatic diopters ( $\Delta$ ), i.e. 43%, 38.5% had a deviation between 10 and  $25\Delta$ , 18.5% had a deviation between 10 and  $5\Delta$ . Ametropia was associated with strabismus in 107 patients or 82% of the cases. Optical and orthoptic treatment was prescribed in 67.7% of cases. 11 patients had deep amblyopia. After treatment 54% of the patients had a final deviation  $\leq 10\Delta$  and 29.1% had a final deviation  $\geq 25 \Delta$ . *Conclusion:* We found as many convergent strabismus as divergent strabismus. The most representative age group was that of 2 to 6 years old. The treatment was optical and orthoptic.

**Keywords:** Strabismus, Amblyopia, Optical Correction

## 1. Introduction

Strabismus is an ophthalmic syndrome characterized by a deviation of the visual axis of one eye relative to the other. This deviation can be constant or intermittent; It may be constant or intermittent, concomitant or not, with primary or secondary sensory changes. Its frequency is 5% in Western caucasian [1-2], in African melanoderma this frequency varies from 0.37 to 1.5 [3-5]. The seriousness of the condition stems from the fact that poorly treated, strabismus leads in a significant number of cases to unilateral amblyopia. On the other hand, when the syndrome is recognized and treated in time, this complication can be

avoided. The aim of this work is to describe the different clinical forms of concomitant strabismus and the results of treatment.

## 2. Patients and Methods

This is a cross-sectional descriptive study conducted in the department of Ophthalmology the University Hospital of Brazzaville from January 2007 to December 2017, a period of 10 years. We collected the records of patients with concomitant strabismus seen by ophthalmologists and an orthoptist. All children benefited from an oculomotor exam and a cycloplegic objective refraction assessment according to the following protocols: either with atropine 0.3% or 0.5%

for 5, and the refraction was carried out on the 7th day; either cyclopentolate combined with tropicamide, alternating instillation every 5 minutes for 25 minutes. The skiascopy or auto-refractometry was done 20 to 30 minutes after the last drop. Ametropia was only taken into account when it was greater than 0.25 diopters

Visual acuity was assessed on the Pigassou scale in preschoolers (between 2 and 6 years old), in school children (between 7 and 16 years old), we used the Monoyer scale. However, in children under 2 years of age, visual acuity has not been evaluated.

The deviation from strabismus was assessed using Behrens' rule, following the Krimsky method evaluated in prismatic diopter ( $\Delta$ ).

An examination of the anterior segment and the fundus was also performed.

Three types of treatment were used in our study: first optical treatment alone used in strabismus with refractive error, consisting of a total optical correction; then an orthoptic treatment was associated with optical treatment when the optical component alone was insufficient, consisting of occlusions; finally a surgical treatment which aimed to restore the parallelism of the ocular axes.

The following parameters were taken into account: age, sex, type of strabismus, angle of deviation of strabismus before and after treatment.

The exclusion criteria were: incomplete record, concomitant, paralytic strabismus, age at onset less than 1 year and encephalopathy. The results were processed by Excel software for the analysis of the data series.

### 3. Results

We collected 130 strabismic patient records out of the 7,722 children received during the study period, a frequency of 1.7%. Forty three (43%) children were boys and 74 (57%) were girls with a sex ratio of 0.75. The average age of the first consultation was  $9.3 \pm 3.2$  years old (1 to 16). Table 1 shows the distribution of patients by age of onset and gender. The age group of 2-6 years old was the most represented with 43.9% of patients.

*Table 1. Distribution of patients by age and gender.*

Gender	Male		Female		Total	
Age (years old)	Number	%	Number	%	Number	%
<2	22	16.9	12	9.2	34	26.1
2-6	18	13.8	39	30	57	43.9
7-10	14	10.8	20	15.4	34	26.1
>10	2	1.5	3	2.3	5	3.9

We found as many convergent as divergent strabismus that affected both girls and boys. The distribution of strabismus by type and gender is shown in Table 2.

Strabismus was monocular in 62.3% of the cases and alternating in 27.7% of the cases.

The associated ametropias, shown in Table 3, were found in 82% of the patients. Eighteen percent of patients were emmetropic.

*Table 2. Distribution of patients by type of strabismus.*

Type of strabismus	Convergent		Divergent		Total	
Gender	Number	%	Number	%	Number	%
Male	26	20	30	23	56	43
Female	37	28.4	37	28.4	74	57
Total	63	48.4	67	51.4	130	100

*Table 3. Distribution of ametropia by gender.*

Gender Ametropias	Female (%)	Male (%)	Total
Hypermetropias	16	33	49
Myopias	9	11	20
Hyperopic astigmatisms	10	14	24
Myopic astigmatisms	6	5	
Mixed astigmatism	2	1	
Total	43	64	107

We found 11 patients with deep amblyopia and 34 cases of unquantifiable visual acuity who corresponded to too young patients whose age was less than 2 years.

According to the initial deviation shown in Table 4, the majority of patients had an initial deviation  $\geq 25\Delta$  or 43% of the cases, 38.5% a deviation between 10 -25 $\Delta$  and only 18.5% had a deviation  $\leq 10$ .

*Table 4. Therapeutic modalities.*

Proposed treatment	Number	Percentage (%)
Optical	4	3.1
Optical + Orthoptic	88	67.7
Orthoptic	20	15.4
Optical + Orthoptic + Surgical	15	11.5
Optical + surgical	3	2.3
Total	130	100

With respect to treatment (Table 4), 67.7% of patients had received optical and orthoptic treatment, 2.3% had received optical and surgical treatment. The three optical, orthoptic and surgical therapeutic methods were used in 20 patients, ie 15.4%. 14.6% of patients with a departure angle  $<10\Delta$  and an iso-acuity were not treated.

The treatment produced the following results: 54% of patients had a final deviation  $\leq 10\Delta$  and 29.1% had a final deviation  $\geq 25\Delta$  (Table 5).

*Table 5. Distribution according to the final deviation.*

	Deviation angle		
	$\leq 10D$	10-25D	$\geq 25D$
Number	70	22	38
Percentage (%)	54%	16.9	29.1

*Table 6. Distribution according to the initial deviation.*

	Deviation angle		
	$\leq 10D$	10-25D	$\geq 25D$
Number	24	50	56
Percentage (%)	18.5	38.5	43

### 4. Discussion

The frequency of strabismus was 1.7% in our study. This frequency was slightly higher than that found by Ebana [4] in

Cameroun which was 1.3%. In Europe, this prevalence is around 5% [1, 2]

Strabismus is often considered a common condition by parents as long as it is not accompanied by a significant decrease in visual acuity and since the child does not complain of pain.

Out of 130 patients in the series, 57% were female with a sex ratio of 0.75. This predominance is also observed by Yogolelo in the DRC and Faghihi in Iran [6, 7]. However, some authors have not noted a predominance of sex [4, 8-10]. The predominance of women can be explained by the fact that the deviation of the visual axes causes aesthetic damage and forces parents to worry much more about their daughters.

The concept of the age of the first consultation is of paramount importance because the prognosis depends on it. The average age varies from study to study. It was  $9.3 \pm 3.2$  years old in our series, 6 years old in that of Azonobi in Nigeria [11], 13 years old according to Ebana in Cameroon [12]. In Asia and western countries, patients are seen early in the first year of life [13-14].

We found as much convergent as divergent strabismus. There is controversy in the literature, indeed some authors have noted a high frequency of divergent strabismus [3, 5, 12], others believe rather that convergent strabismus is the most frequent form [6, 15, 16]. Thus esotropia is the most frequent deviation in children because of the accommodation-convergence synergy, a phenomenon which is present in near vision, thus bringing the adductor muscles of the eye into play resulting in convergence.

Strabismus was alternating in 27.7% of cases. This rate is lower than that found by Hugonnier [17] who noted it in 80% of cases.

Astigmatism was associated with ametropia in 82% of patients, with a high frequency of hyperopia (49%). These results are comparable to those reported by Yogolelo [6] in the DRC where hyperopia was the common form of ametropia (45.7%). Essential strabismus was also one of the significant causes in our series. For Hugonnier [17] this variation represents 25% of cases.

Amblyopia was present in 11 of our patients and it is often related to anisometropia. This shows the importance of the early management of ametropia in strabismus [12].

The treatment of strabismus calls for a total optical correction with constant wear for 2-3 months. In our study, the treatments offered were of diverse, but the majority of our patients, 67.7%, received optical and orthoptic treatment. This made it possible to go from a proportion of 18.5% of patients with a deviation less than  $10\Delta$  to 54%, an increase of 35.5% in this group. However 29.1% of the patients kept a deviation greater than  $25\Delta$ . Our results correspond to those observed by Lebuissou [18] who states that 30 - 50% of strabismus recover all of the monocular and binocular sensory function. Patients undergoing optical, orthoptic and surgical treatment had binocular vision with aesthetic healing. The overall therapeutic result was satisfactory because 54% of cases had recovered from a physiological deviation  $\leq 10\Delta$ . Positive outcomes depend on the earliness of

the treatment [19, 20] because of the age of discovery of the disease and the start of treatment generally occurring before 2 years old. The older the child gets, the worse the outcome.

## 5. Conclusion

Strabismus was as much convergent as divergent in equal proportions, more representative in the age group of 2 to 6 years old. The most common associated ametropia was hyperopia. The treatment reduced the strabismic angle in 35.5% of the patients.

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