

소아재활

게시일시 및 장소 : 10 월 19 일(토) 08:30-12:30 Room G(3F)

질의응답 일시 및 장소 : 10 월 19 일(토) 11:00-11:30 Room G(3F)

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Strabismus is Correlated with Gross Motor Function in Children with Spastic Cerebral Palsy

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Purpose

To investigate the correlation between clinical features of strabismus and motor dysfunction classified according to the Gross Motor Function Classification System (GMFCS) in patients with spastic cerebral palsy (CP).

Methods

In this retrospective, cross-sectional study in single tertiary medical center, 62 patients who are diagnosed with spastic CP who had an ophthalmic examination between 2006 and 2014 were included. Only patients with vision sufficient to fixate were included and patients with restrictive or paralytic strabismus were excluded. The types of CP were classified as diplegia, hemiplegia, or quadriplegia for distribution of motor impairment. The GMFCS was used to grade gross motor dysfunction, which was then classified as mild (grade 1, 2 and 3) or severe (grade 4 and 5) motor impairment(Table 1). Strabismus was investigated in terms of direction, constancy, and deviation angle. The relationship between strabismus characteristics and the level of GMFCS and type of CP were assessed.

Results

Thirty-eight and 24 patients had mild or severe motor deficit, respectively(Table 2). Forty patients had strabismus, which was more frequent in patients with severe motor impairment ($P = .014$). Exotropia and esotropia occurred with similar frequency. Constant and large-angle strabismus was frequently observed in patients with severe motor impairment.($P < .005, 0.027$)(Fig. 1). The topographical subtype of CP was not related to clinical features of strabismus(Fig. 2). There was no correlation between the refractive errors and the GMFCS severity(Table 3). Visual acuity was measured in 32(51.6%) patients(Table 4). GMFCS grade was only the risk factor for strabismus on univariate($P = .001$) and multivariate($P = .001$) analysis(Table 5).

Conclusions

The prevalence of strabismus is higher in severe motor impairment. The constancy and angle of strabismus was related to the severity of motor impairment while the topographical subtype of CP has no significant relationship.

Table 1. Gross Motor Function Classification Scale.

Level	Functional capacity
1	Walks without assistance; limited advanced motor skills
2	Walks without assistance; limited advanced walking
3	Walk with assistive walking device
4	Self-mobility with a transporter
5	Self-mobility with a transporter; severely limited

Table 2. Baseline characteristics according to the Gross Motor Function Classification Scale (GMFCS).

GMFCS	1	2	3	4	5
number of the patients	12	13	13	14	10
Gender (M: F)	4:8	7:6	7:6	9:5	7:3
Gestational Age (Average (range), weeks)	31.8 (26-40)	30.9 (27-40)	30.9 (26-42)	31.3 (26-39)	31.6 (28-37)
Birth weight (Average (range), grams)	1680 (680-3900)	1610 (780-2750)	1690 (1000-3850)	1690 (920-2690)	1640 (1310-2550)
Age at ophthalmic examination, years, mean (range)	6.63 (1.18-14.56)	4.54 (0.94-10.97)	4.94 (0.92-18.33)	4.89 (0.85-10.74)	4.17 (1.72-8.22)
Age at grading GMFCS, years, mean (range)	9.41 (5.23-15.12)	10.14 (6.37-17.12)	10.12 (3.81-17.7)	8.24 (2.02-13.82)	8.9 (1.1-13.66)
Extent of motor impairment					
Diplegia	9	9	11	8	5
Hemiplegia	2	2	0	0	0
Quadriplegia	1	2	2	6	5

Table 3. Refractive error according to the Gross Motor Function Classification Scale (GMFCS).

GMFCS	1	2	3	4	5
High astigmatism ($D_{cyl} \leq -3.0D$)	3	1	2	5	1
High Hyperopia ($SE \geq 5.0D$)	0	1	0	1	1
High myopia ($SE \leq -6.0D$)	2	0	0	0	0
significant refractive error	4	2	2	6	2

D = diopter, Dcyl = diopter cylinders, SE = standard error of the mean

Table 4. Visual acuity according to the Gross Motor Function Classification Scale (GMFCS).

GMFCS	1	2	3	4	5
number of the patients	9	10	6	7	0
logMAR (Average (range))	0.06 (0- 0.3)	0.41 (0-1.5)	0.32 (0-0.5)	0.49 (0.2-1.2)	N/A
Differences in visual acuity between both eyes ≥ 2 lines (number of the patients)	1	2	2	2	N/A

Table 5. Risk factors of strabismus in patients with cerebral palsy.

	Univariate analysis			Multivariate analysis		
	P-value	Exp(B)	95% CI	P-value	Exp(B)	95% CI
Gestational age	0.461	1.057	0.912 - 1.225	0.459	1.12	0.830 - 1.513
Birth weight	0.79	1.115	0.500 - 2.486	0.506	0.572	0.111 - 2.962
Spherical equivalent	0.791	0.975	0.811 - 1.173	0.398	0.908	0.727 - 1.135
GMFCS	0.001	2.3	1.413 - 3.743	0.001	2.242	1.417 - 4.133
Topographical distribution of CP	0.114	1.706	0.879 - 3.309	0.536	1.34	0.530 - 3.387

GMFCS = Gross Motor Function Classification Scale

CP = Cerebral palsy

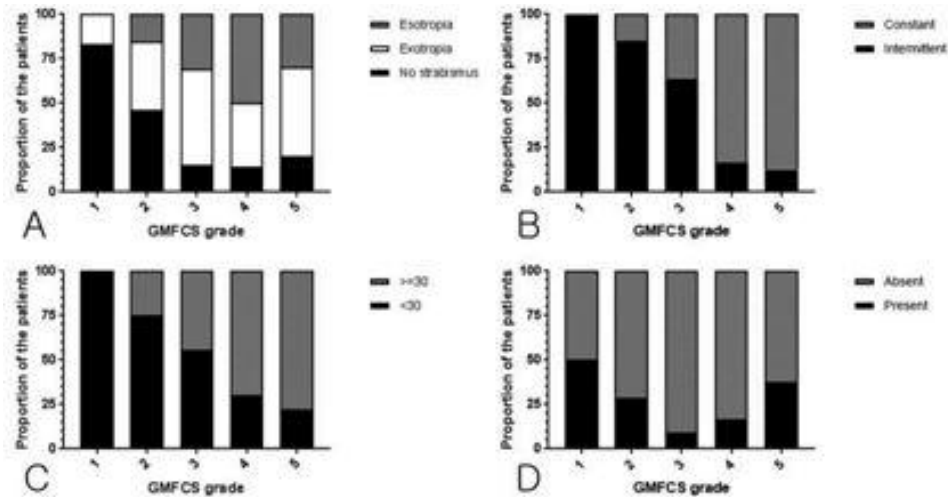


Figure 1. Presence and characteristics of strabismus according to the gross motor function classification scale. Strabismus is more frequent in severe motor deficit (group S, GMFCS 4–5) than in mild motor deficit (group M, GMFCS 1–3) and exotropia and esotropia occur with similar frequency (a). Constant strabismus (b) and large angle (more than 30 prism diopters) strabismus (c) are more often seen in severe CP. Accompanying vertical strabismus does not differ (d).

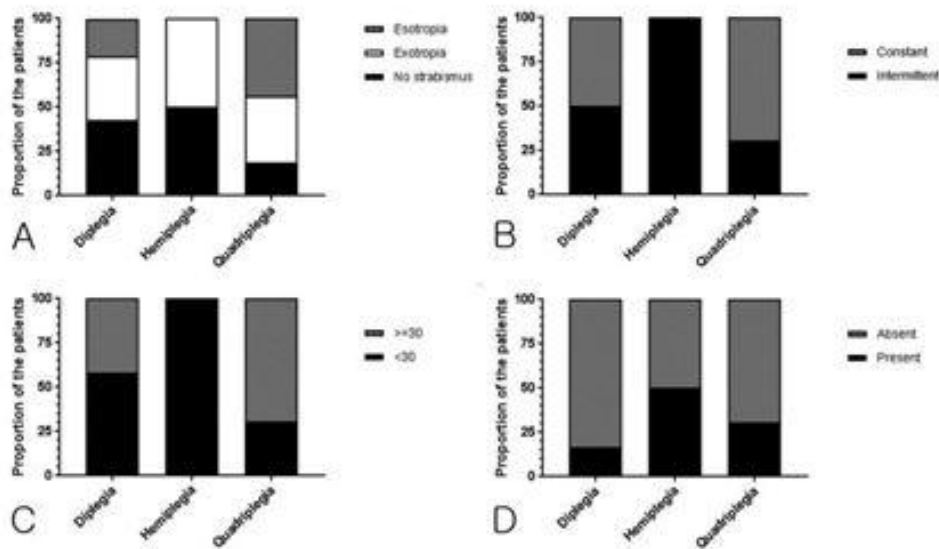


Figure 2. Presence and characteristics of strabismus according to the topographical distribution of motor impairment. Prevalence, type of horizontal strabismus (a), distribution of intermittency (b), deviation angle (c) and accompanying vertical strabismus (d) were not different according to the topographical subtype of motor impairment.