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The Effect of Endocrine Disrupting Chemicals to Precocious Puberty in Children with Exposure History of 'Slime'

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Background & Objective

Recently, the puberty is becoming to start earlier. This early beginning of the puberty seems to be multi-factorially related to genes, hormones and environmental factors. It has been already known in many animal experiments that environmental hormones (Endocrine Disrupting Chemicals, EDCs) are deeply involved in regulation of endocrine systems. However, clinical studies in humans are limited. Recently, the toy of 'Slime' which thought to contain EDCs such as phthalates is very popular in primary school children. This study was done to see the effect of EDCs in primary school-aged children's puberty.

Material & Methods

Study patients consisted of 140 children whom GnRH stimulation tests were done due to precocious puberty between Jan 2018 and Dec 2018. Twenty-seven boys and 113 girls were enrolled. Precocious puberty was defined when the first pubertal sign begin below the age of 8 years(yrs) in girls and 9 yrs in boys along with the advanced bone-age ≥ 1 yr. GnRH stimulation tests were performed in all study patients. Study patients were classified into two groups; 'GnRH + group' (peak LH ≥ 5mU/mL) and 'GnRH - group' (peak LH < 5 mU/mL). The exposure history of EDCs was accepted when study patients play with 'slime' ≥ 3 times/week for ≥ 3 months at the time of GnRH stimulation tests. Changes of bone-age, auxological data and various laboratory data were retrospectively analyzed.

Results

Fifty-eight (41.4%) were enrolled in 'GnRH+ group', and 82 (58.6%) in 'GnRH- group'. Seventy-nine out of 140 (56.4%) showed a significant exposure history of EDCs; 14/58 (24.1%) in 'GnRH+ group' and 65/82 (79.2%) in 'GnRH- group'. A significant exposure history of EDCs was statistically higher in 'GnRH- group' compared to 'GnRH+ group' ($p<0.05$)(Table 1). Bone-age advancement was also higher in patients with significant exposure history of EDCs compared to without it ($p<0.05$)(Table 2). The possibility of GnRH agonist treatment was 5.55 times higher in patients with significant without exposure history of EDCs compared to exposure history of EDCs ($p<0.05$)(Figure 1).

Table 1. Clinical and laboratory characteristics study groups

Characteristic	GnRH(+)(n=58)	GnRH(-)(n=82)	*p* value
CA(yr)	6.99±0.82	7.08±1.09	0.600
BA-CA(yr)	0.55± 1.22	0.95± 1.12	0.053
Tanner stage	3.33 ±0.75	2.83± 0.56	<0.05
Basal LH(mIU/mL)	0.80±3.47	0.08±0.10	0.065
Peak LH(mIU/mL)	9.63± 9.25	2.38±1.17	<0.05
Basal FSH(mIU/mL)	3.02±1.60	1.77±1.25	<0.05
Peak FSH(mIU/mL)	21.89±7.69	14.32±6.75	<0.05
Peak LH/Peak FSH	0.50±0.48	0.19±0.11	<0.05
EDCs exposure(N, %)	14 (24.1%)	65 (79.2%)	<0.05

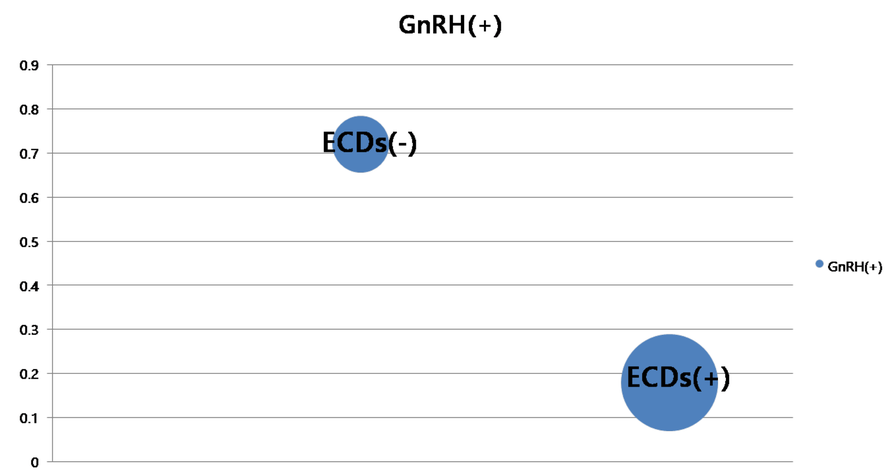
CA, chronological age; yr, years; BA, Bone age; LH, Luteinizing hormone; FSH, Follicle-stimulating hormone; N, number

Table 2. Differences clinical and laboratory characteristics according to EDCs exposure

Characteristic	EDCs(+)(n=79)	EDCs(-)(=61)	*p* value
BA-CA(yr)	0.92±1.30	0.59±1.15	<0.05
Tanner stage	2.92±0.64	3.18± 0.74	<0.05
Basal LH(mIU/mL)	0.43±2.90	0.31±0.89	0.733
Peak LH (mIU/mL)	3.70±5.23	7.80±8.17	<0.05
Basal FSH(mIU/mL)	1.96±1.44	2.71±1.54	<0.05
Peak FSH(mIU/mL)	15.79±7.27	20.06±8.47	<0.05
Peak LH/Peak FSH	0.25±0.26	0.42±0.43	<0.05
GnRH positive(N, %)	14 (17.7%)	44 (72.1%)	<0.05

*GnRH(+) : Percentage of positive of GnRH stimulation test.

Figure 1. Relation of exposure History of EDCs and GnRH stimulation test



The possibility of GnRH agonist treatment was 5.55 times higher in patients with significant without exposure history of EDCs compared to significant exposure history of EDCs ($p<0.001$).
Result of Chi-square test for comparison between two groups

CONCLUSION

This It can be said that the exposure of EDCs seems to be related to the early pubertal onset and rapid bone-age advancement. Further study is necessary.

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