

주의력결핍 과잉운동장애 남아에서 중추신경자극제가 주의력과제 수행 중의 대뇌 기능적 국소화에 미치는 효과*

EFFECT OF METHYLPHENIDATE ON FUNCTIONAL CEREBRAL LOCALIZATION DURING ATTENTIONAL TASKS IN BOYS WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER

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(ADHD) methylphenidate
(Quantitative En -
cephalography ; Q - EEG)
methylphenidate가
DSM - IV ADHD 6 12 13 , Connors
(Child Behavior Checklist ; CBCL) 가 methylphe - nidate
TOVA (Test of Variables of Attention)
Q - EEG 1 methylphenidate 0.7mg/kg 1 1
Q - EEG Q - EEG
Q - EEG
theta beta
(theta/beta) 가
methylphenidate
methylphenidate가
가 ADHD

중심 단어 : Methylphenidate.

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서론
(Attention Deficit Hyperactivity Disorder ; ADHD)

Jasper¹⁾
ADHD

Satterfield²⁾ Matousek
ADHD

(event - related potentials ; ERP)
P300

P300
N100
ADHD

(Positron emission tomography ; PET),
(Single - photon emission computed tomography ; SPECT),
(Magnetic resonance imaging ; MRI)
(Magnetic resonance spectroscopy ; MRS)
ADHD

(Quantitative - EEG ; Q - EEG)
ADHD

Callaway⁹⁾ ADHD
P₃, Oz, P₄
Mann²⁰⁾
Kuperman

²¹⁾ ADHD
가
ADHD
가
가
1
가

Methylphenidate
²⁶⁾

ADHD PET
methylphenidate
가²⁷⁾

²⁸⁾ SPECT
ADHD
가

Lubar²⁹⁾ methylphenidate
(resting condition)
band theta/beta
ratio
가

ADHD
가
methylphenidate

가
가
³⁰⁾ ADHD

ADHD
methylphenidate
methylphenidate

연구 방법

1. 연구대상
1997 1 1997 8 DSM - IV
³¹⁾ ADHD 6 12
(1 6)
Kuperman 13

(laterality)

. KEDI -
WISC(Korean Educational Development Institute - Wechsler Intelligence Scale for Children) 가 20 50 epoch
(IQ 70) fast Fourie transform(FFT)
30 (μV)
theta/beta ratio (brain map)
³³⁾
가
2) 약물 투여방법 1
(oral
consent) 가 methylph-
2. 연구방법 enidate 1
Conners 가 (Conners Rating Scale for parent and teacher ; CRSP CRST)³²⁾ 0.5 0.9mg/kg 0.7mg/kg
(CBCL) ADHD 1
methylphenidate Q - EEG
TOVA 3) 주의력과제
Q - EEG , 1 TOVA
1 (continuous performance test ; CPT)
Q - EEG (Universal attention disorder inc. 1990 , California, USA).
1) 정량화 뇌파검사 방법 22.2%가 ,
10 77.8%가
2
32 (Electro Cap , 1994 4
, Eaton, Ohio, USA)
international 10 20 system
10k
4) 자료 분석
TOVA paired t -
. Meth - test
ylphenidate ratio , theta/beta
paired t -
Neuronics(, 1995 , test t
) (t - statistical probability map ;
Statistical
) (artifact) 1 Analysis System(SAS)
epoch epoch 256 p<0.05

연구 결과

1. 연구대상의 특성 및 약물투여용량

8.6(±1.4) ,
 6.9 11.5 . KEDI - WISC
 (FIQ) 98.2(±17.9)(74
 127) , (VIQ) 101.8(±13.4)
 (80 123), (PIQ) 94.5(±20.5)
 (72 128) VIQ PIQ
 .
 30.8(±9.6)kg
 21 52kg .
 ADHD 가 Connors 가
 18.8(±3.2) (14
 24), 19.6(±6.1) (7 30) .
 1 methylphenidate 20.8
 (±6.1)mg 15mg, 35mg

2. TOVA 검사 결과

Methylphenidate TOVA
 Table 1 . TOVA
 (t=5.16, p<.05) (t=4.69, p<.05)
 가

3. 정량화 뇌파

1) 안정상태의 정량화 뇌파

theta/
 beta ratio , Table 2

2) 주의력과제 수행 중의 정량화 뇌파

TOVA 가
 theta/beta
 ratio , Table 2

Fig. 1 theta/beta ratio paired t -
 test t (t -

Table 1. Changes of TOVA* score between change drug-free and drug-loaded periods

Variable	Drug-free mean(SD)	Drug-loaded mean(SD)	t value	p value
Omission error(%)	64.9(10.2)	53.8(8.7)	5.16	0.000
Commission error(%)	49.8(11.8)	46.8(9.4)	0.93	0.371
Response time(msec)	68.8(14.8)	61.4(16.0)	1.99	0.069
Variability(msec)	69.6(13.2)	54.9(12.0)	4.69	0.001

*TOVA : Test of variables of attention

Table 2. Comparative Q-EEG θ/β ratio between drug-free and drug-loaded periods during resting state and stimulated state

Electrode	Resting state			Stimulated state		
	Drug-free	Drug-loaded	p	Drug-free	Drug-loaded	p
F3	1.42	1.43	NS	1.21	1.22	NS
F7	1.22	1.25	NS	1.10	1.13	NS
F4	1.32	1.31	NS	1.14	1.32	NS
F8	1.24	1.17	NS	1.04	1.12	NS
T3	1.16	1.00	NS	0.85	1.02	NS
T5	1.39	1.40	NS	1.32	1.57	.004
T4	0.97	1.04	NS	0.95	1.03	NS
T6	1.28	1.34	NS	1.34	1.51	.05
P3	1.55	1.53	NS	1.51	1.61	NS
P1	1.55	1.53	NS	1.51	1.66	NS
O1	1.37	1.34	NS	1.36	1.47	NS
P4	1.50	1.45	NS	1.48	1.58	NS
P2	1.43	1.45	NS	1.48	1.66	.01
O2	1.34	1.35	NS	1.38	1.55	.01

NS : statistically not significant

SPM)

p

고 찰

ADHD

methylphenidate

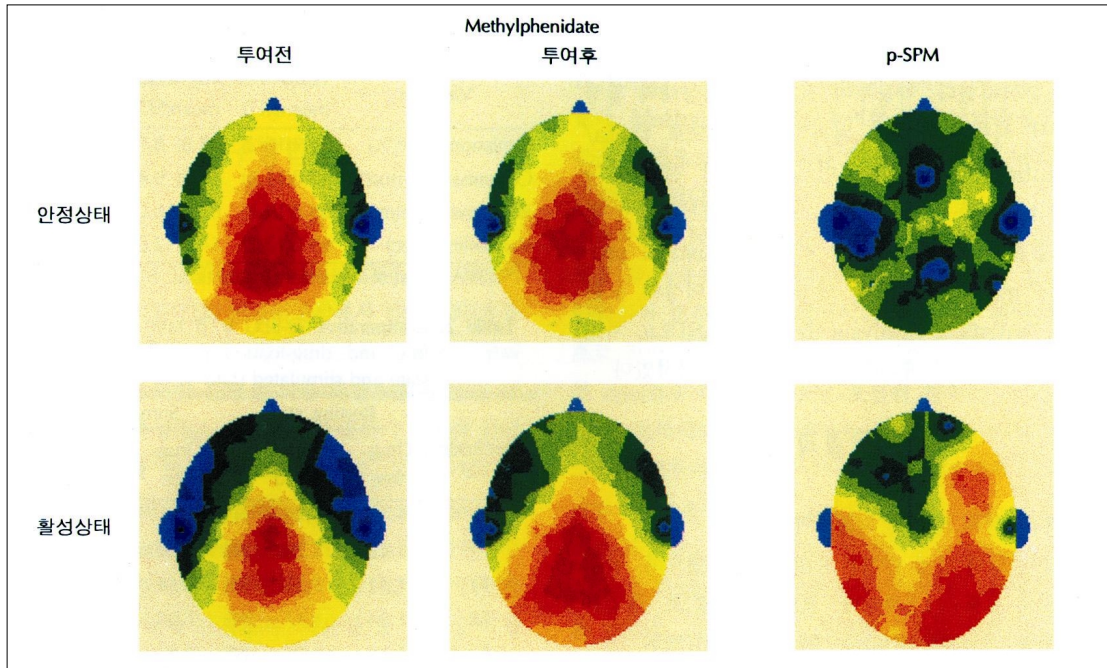


Fig. 1. Methylphenidate 투여에 의한 뇌파활동성(theta/beta)의 변화.

band theta/ 가
 beta ratio , methylphenidate가 ADHD
 가 ,
 가 ,
 5) Voeller³⁴⁾ 가 . Riccio
 ADHD
 (disconnection)
 methylphenidate
 (inhibitory) 12)38)39)
 가
 methylphenidate 40)
 (posterior parietal cortex),
 methylphenidate가 (inferior parietal lobule)
 methylphenidate (premotor - pref -
 가 ADHD theta/beta ratio rontal cortex) (cingulate gyrus),
 Lubar 29) (superior colliculus), (pulvinar),
 , methylphenidate (striatum) 가 41-43).
 methylphenidate 가 44)45), (vigilance)

region),
Mirsky⁴⁶⁾

60 가

(septal²⁷⁾

가

가

ADHD

ADHD

가

ADHD

가

가

가

가

⁴⁷⁾

PET

가

가¹³⁾

가

PET, SPECT

가

ADHD

⁴⁸⁾

ADHD

가 가

가

, methylpheni-

date 1

⁴⁹⁾ ADHD

1

methylphenidate(0.35mg/kg)

PET

6

methylphenidate

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This study aims at investigating the effects of psychostimulant on functional cerebral localization during the attentional tasks in ADHD. Inclusion subjects were 13 boys between 6 -12 years old who met the DSM-IV criteria for ADHD. In each patient, there was a drug-free period (without methylphenidate) and a drug-loaded period (with oral methylphenidate administration), and within each period there was a resting state and a stimulated state with TOVA. Comparisons were made by measuring the amplitudes of four bands (delta, theta, alpha, beta) of quantitative EEG to see if there were any differences between the drug-free period (resting and stimulated) and the drug-loaded period (resting and stimulated). In the resting state, there was no difference between the drug-free and drug-loaded periods. In the stimulated state with TOVA, the presence of methylphenidate induced significant changes in the theta to beta ratio (/) in the right frontal, right parieto-occipital, and left temporal-parietal areas in contrast to the drug-free period. These data suggest that methylphenidate shows electrophysiological influences on cerebral topographical activities during the attentional tasks in ADHD.

KEY WORDS : Attention deficit hyperactivity disorder · Cerebral localization · Quantitative electroencephalography · Methylphenidate.