

여성 우울증 환자의 전두엽 백질 대사물질에 대한 양성자 자기공명분광 연구 : 충동성과의 관계

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_{1, 2, 3, 4}

ABSTRACT

¹H-MRS Study on the Frontal Lobe White Matter Metabolites in Female Patients with Depression : Relations to Impulsivity

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Objective : The frontal lobe white matter (FLWM) is suggested to play an important role in the pathophysiology of depression. In this study, metabolites in the normal appearing FLWM and their clinical meaning in female subjects were evaluated. **Methods :** Using proton-magnetic resonance spectroscopy, the ratios of metabolite peaks in the FLWM were measured *in vivo* in 14 female patients with major depressive disorder and were compared with 12 age-matched normal controls. The ratios' clinical significance was analyzed with respect to severity of depression (Hamilton Depression rating Scale score and Beck Depression Inventory score) and trait of impulsivity (Barratt Impulsiveness Scale). **Results :** There were no significant differences in the NAA/Cr, Cho/Cr, Cho/NAA ratio between depressed and control subjects. But right FLWM Cho/Cr ratios in control and depressed subjects were found to be positively correlated with total and motor impulsiveness score as measured by the Barratt Impulsiveness Scale. **Conclusion :** The biochemical changes in the FLWM may provide some of the neurobiological substrates to personality trait, impulsivity. Further researches on the underlying mechanisms of impulsivity traits are needed. (Korean J Psychopharmacol 2005;16(4):309-316)

KEY WORDS : Major depressive disorder · Frontal lobe · White matter · Impulsivity · ¹H-magnetic resonance spectroscopy.

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서론

1,2) 가

3) 가

4) 가

5) 가

6,7) 가

8) 가

9) 가

10,11) 가

12) 가

13) 가

14,15) 가

16,17) NAA

18) Cho

phosphatidylcholine (PtdCho)

phosphocholine (PCho)

glycerophosphocholine (GP-Cho)

Cho) Cho 80%

Cho

17,19,20) Cr

NAA Cho

17,21)

가 가 가

방법

1. 연구대상

1) 18 55

2) Diagnostic and Statistical Manual of mental Disorders(DSM) - IV²²⁾

Structured Clinical Interview for DSM IV (SCID) - I²³⁾ 가 , 3) 17

가 (Hamilton depression rating scale, HDRS)²⁴⁾ 가 19 , 4)

1

(psychotropic medication)

가

1) 가

Cushing , 2)

, 3)

, 4) , 5)

DSM - IV 가

, 6)

, 7) (electroconvulsive therapy)

25) 26)
14
12
(Institutional Review Board)

2. 임상 상태 평가

가 ,
가 .
(severity) 가 가 17
HDRS²⁴⁾ 가 가 Beck
(Beck Depression Inventory, BDI)²⁷⁾
가 .
11 Barratt (Barratt Im-
pulsiveness Scale, BIS)²⁸⁾ . BIS
23 4 Likert ,
 . BIS 3가 ,
(cognitive impulsiveness), (motor
impulsiveness), (non - planning impul-

siveness)

3. 양성자 자기공명분광의 측정

1.5 Tesla (Gyrosan, Phillips
Medical System, Best, Netherlands)

가
가 Axial T1, T2
coronal T2 가
1.5 × 1.0 × 3.0 cm³ VOI(volume of
interest) axial T2 (4,000 msec
TR, 105 msec TE, field of view 22 × 22 cm, slice
thickness 5.0 mm, slice gap 0.5 mm)
VOI(voxel)
(1). 가 voxel PRESS
(Point Resolved Spectroscopy) pulse
가
(: TR, 2,000 msec ; TE, 272 msec ; num-
ber of excitation, 128).
가 LCMoel²⁹⁾
, 2.02 ppm NAA 가,
3.03 ppm Cr 가, 3.2 ppm Cho
가 . NAA, Cho

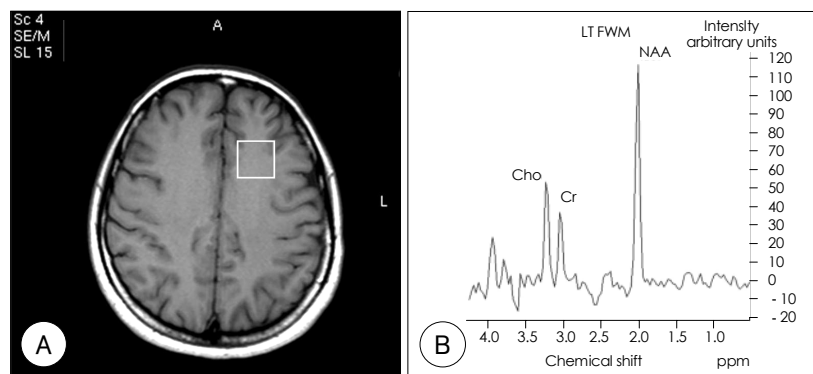


Figure 1. A : The magnetic resonance imaging shows the location of voxel defined for spectroscopy measurements. Spectra were acquired sequentially from 1.5 × 1.0 × 3.0 cm³ voxel in the left and right FLWM. B : Representative ¹H-magnetic resonance spectrum corresponding to a 1.5 × 1.0 × 3.0 cm³ voxel in the left FLWM. The three main signals, NAA, Cr, and Cho are labeled accordingly. FLWM : frontal lobe white matter, NAA : N-acetyl-L-aspartate, Cr : creatine, Cho : choline containing compounds.

Cr (HDRS, BDI), BIS
 Pearson (two-tailed)
 SPSS 11.0 ver-
 sion(SPSS Inc., Chicago, Illinois, USA)
 p<0.05

4. 통계 분석

NAA/Cr, Cho/
 Cr, Cho/NAA

Kolmogorov - Smirnov test
 Kolmogorov - Smirnov test
 가
 unpaired t - test

결과

1. 환자군과 대조군의 인구학적, 임상적 차이

가 31.4 (SD=10.2)
 가 3.0 (SD=2.0)

Table 1. The demographic and clinical variables of patients with major depressive disorder and matched control subjects

	MDD (N=14)	Controls (N=12)	t-value	p-value
	Mean ± SD	Mean ± SD		
Age, years	39.8 ± 9.7	39.5 ± 10.3	-0.07	n.s
Education, years	11.5 ± 3.5	11.5 ± 1.7	0.00	n.s
Onset age (years)	31.4 ± 10.2	-		
Number of episodes	3.0 ± 2.0	-		
HDRS	30.4 ± 4.1	1.3 ± 1.5	-24.66	0.000*
BDI	27.8 ± 9.8	3.2 ± 2.7	-9.01	0.000†
BIS				
Total	35.9 ± 9.4	27.2 ± 9.7	-2.68	0.013†
Non-planning	15.7 ± 5.6	10.1 ± 5.0	-2.96	0.007*
Motor	9.1 ± 5.3	8.3 ± 3.1	-0.81	n.s
Cognitive	11.1 ± 3.2	8.8 ± 4.4	-1.80	n.s

MDD : major depressive disorder, N : number of subjects, HDRS : Hamilton Depression Rating Scale, BDI : Beck Depression Inventory, BIS : Barratt Impulsiveness scale. * : p<0.01, † : p<0.05, n.s : not significant

Table 2. The comparison of the ratios of the frontal lobe white matter metabolites NAA, Cr and Cho between patients with major depressive disorder and control subjects

	MDD (N=14)	Controls (N=12)	t-value	p-value
	Mean ± SD	Mean ± SD		
Left FLWM				
NAA/Cr	2.67 ± 0.52	2.98 ± 0.55	1.50	n.s
Cho/Cr	0.52 ± 0.10	0.52 ± 0.08	0.21	n.s
NAA/Cho	5.20 ± 0.68	5.72 ± 0.83	1.76	n.s
Right FLWM				
NAA/Cr	2.63 ± 0.79	2.71 ± 0.34	0.33	n.s
Cho/Cr	0.56 ± 0.10	0.52 ± 0.07	-0.98	n.s
NAA/Cho	4.61 ± 1.37	5.29 ± 0.93	1.45	n.s

MDD : major depressive disorder, N : number of subjects, FLWM : frontal lobe white matter, NAA : N-acetyl-L-aspartate, Cr : creatine, Cho : choline-containing compounds, n.s : not significant

HDRS (t = -24.7, df = 16.9, p < 0.01) BDI
 (t = -9.0, df = 15.2, p < 0.01)

BIS
 (t = -2.7, df = 24, p < 0.05)
 (t = -2.9, df = 24, p < 0.01)가
 BIS

가 (1).

2. 전두엽 백질 대사물질들과 임상 특징들 사이의 상관관계

NAA/Cr, Cho/Cr NAA/Cho unpaired t-test
 , 가

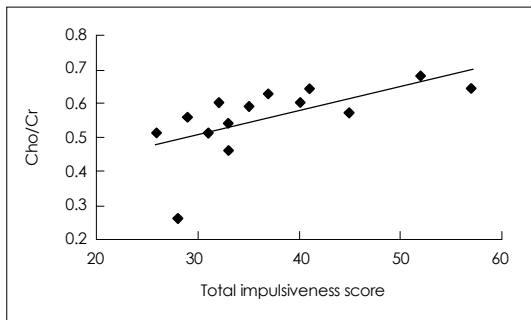


Figure 2. The scatter plots of correlation between total impulsiveness scores as measured by Barratt Impulsiveness Scale and the right FLWM Cho/Cr ratios in subjects with major depressive disorder (N=14). FLWM : frontal lobe white matter, Cho : choline containing compounds, Cr : creatine.

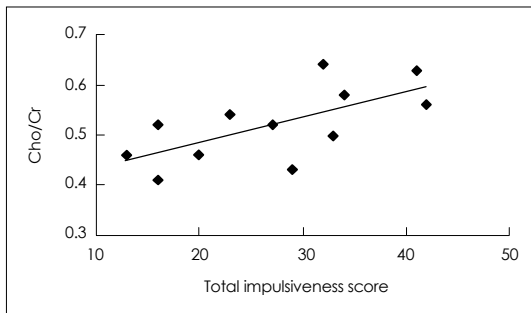


Figure 3. The scatter plots of correlation between total impulsiveness scores as measured by Barratt Impulsiveness Scale and the right FLWM Cho/Cr ratios in control subjects (N=12). FLWM : frontal lobe white matter, Cho : choline containing compounds, Cr : creatine.

(2). NAA/
 Cr, Cho/Cr, NAA/Cho , ,

BIS Cho/Cr
 (r=0.623, p=0.017)
 (r=0.589, p=0.027)

가 (2).

Cho/Cr
 (r=0.667, p=0.018), (r=
 0.639, p=0.025) 가

(3).

HDRS, BDI 가

고 찰

Gruber ³⁰⁾
 Cr 가
 NAA/Cr, Cho/Cr myo - inositol/Cr

³¹⁾ Cho/Cr, myo - inositol/Cr ³²⁾ NAA/Cr
 가

가

가

가

가
 가

Cho/Cr

BIS

Cho

^{19,20)}

가 tisol diacylglyce-
rol eicosanoids phospholi-
pase A2(PLA2) PtdCho
cortisol 가 Cortisol
33)
6,7,34-36) Cho Cushing
¹H - MRS 45)

가 Horn 7)
가 HPA axis
가 HPA axis 가
Asahi 37)

38,39) 가 voxel
가 voxel
Duc 40) voxel
(positron emission tomography, PET) voxel
가 ¹H - MRS Cho 가
가 Cho voxel
가 voxel
fMRI voxel
37) ¹⁸F - fluorodeoxyglu-
cose PET 가 ¹H - MRS Cho GPCCho
41) 가 PCho 가
Cho Cho
가 PLA2
phosphodieters,
(hypothalamic - pituitary - adrenal axis, HPA axis) phosphomonoesters ³¹P - MRS
가 42-44) 가 21)
cortisol . Cor- 가

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