

Factors Affecting Development of Epilepsy and Postoperative Recurrence of Epilepsy in Primary Brain Tumor

Ok Joon Kim, M.D., Gue-Yong Lee, M.D., Jung-Ho Seo, M.D., Byung-Ok Choi, M.D.,
Jung Yong Ahn, M.D.*, Byung-In Lee, M.D.†

Department of Neurology, Pochon CHA University, College of Medicine
*Department of Neurosurgery, Pochon CHA University, College of Medicine**
Department of Neurology, Yonsei University, College of Medicine†

Background: A small but significant proportion of patients with brain tumors continued to have seizures postoperatively. All of them could not be explained simply by the failure to adequately resect the tumor mass. We investigated factors influencing seizure recurrence in primary brain tumors. **Methods :** We analyzed 435 patients treated with tumor surgery and examined the differences between epileptic seizure group (ESG) and non-epileptic seizure group (NESG). Among ESG, we selected 99 patients confirmed by pathology. We divided patients into chronic epileptic seizure group (CESG; duration of seizure attack ≥ 1 year) and acute epileptic seizure group (AESG; < 1 year). We also investigated the differences between two groups. **Results :** Of 435 patients, 104 were ESG and 331 NESG. Among various factors, male, favorable neurological state, fronto-temporal lobe origin, astrocytoma, oligodendroglioma were statistically significant in ESG compared with NESG ($p < 0.05$). Of 99 patients, 43 were CESG and 56 AESG. Among various factors, seizure recurrence rate without residual tumor or tumor recurrences was significantly higher in CESG than in AESG ($p < 0.05$). On the other hand, the laboratory abnormalities, and the rate of residual tumor or tumor recurrences on follow-up MRI were significantly higher in AESG than in CESG ($p < 0.05$). **Conclusions :** Among many factors, sex, neurological state, location and pathology of tumors were significantly related to seizure attacks in brain tumor. There were the differences of epileptogenesis between AESG and CESG. We suggest that patients with brain tumor and chronic epilepsy have to be investigated with extensive work-up including invasive electrophysiologic studies.

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Key Words : Brain neoplasm, Epilepsy, Epileptogenesis, Recurrence of seizure

가
1%
50%,^{1,2}
35 ~ 40%가³

aberrant neuronal network가⁴

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* Address for correspondence

Byung In Lee, M.D.

Department of Neurology,
Yonsei University, College of Medicine
Seodaemun-gu, C.P.O Box 8044, Seoul 120-752, Korea
Tel : +82-2-361-5460 Fax : +82-2-393-0705
E-mail : neuro@yumc.yonsei.ac.kr

Table 1. Clinical manifestations of the patients with brain tumor

	ESG (%) (n=104)	NESG (%) (n=331)	P value*
Age (mean, y-o)	35.9	35.2	0.452
M:F	69:35	145:186	0.000
Neurological deficits on admission			0.000
Normal	75 (72.1)	108 (32.6)	
Abnormal	29 (27.9)	223 (67.4)	
Post-operative state at discharge			0.034
Normalized	77 (74.1)	207 (62.5)	
Neurological deficits	25 (24.0)	96 (29.0)	
Hopeless or die	2 (1.9)	28 (8.5)	

*t-test, chi-square test, ESG; epileptic seizure group, NESG; non-epileptic seizure group, M; male, F; female

Table 2. Pathology and location of brain tumors

	ESG (%) (n=104)	NESG (%) (n=331)	P value*
Pathology of the tumor			
Glioblastoma multiforme	24 (23.1)	72 (21.8)	0.001
Astrocytoma	47 (45.2)	81 (24.5)	
Ependymoma	1 (1.0)	15 (4.5)	
Medulloblastoma		24 (7.3)	
Oligodendroglioma	15 (14.4)	8 (2.4)	
Meningioma	3 (2.9)	28 (8.5)	
Schwannoma	1 (1.0)	51 (15.4)	
Craniopharyngioma	1 (1.0)	12 (3.6)	
Dermoid, teratoma			
Others	12 (11.4)	40 (12.1)	
Location of the tumor			
Cortical lesion	90 (86.5)	102 (30.8)	0.000
Frontal	31 (29.8)	22 (6.6)	0.045
Temporal	20 (19.2)	15 (4.5)	
Parietal	10 (9.6)	20 (6.0)	
Occipital	3 (2.9)	3 (0.9)	
Adjacent cortex	24 (23.1)	33 (10.0)	
Bilateral cortex	2 (1.9)	9 (2.7)	
Intraventricle	1 (1.0)	19 (5.7)	
Anterior fossa		5 (1.5)	
CPA		55 (16.6)	
Posterior fossa		84 (25.4)	
Suprasella	2 (1.9)	15 (4.5)	
Basal ganglia	1 (1.0)	18 (5.4)	
Falx		2 (0.6)	
Multiple	6 (5.8)	18 (5.4)	
Combined	4 (3.8)	13 (3.9)	

*chi-square test, ESG; epileptic seizure group, NESG; non-epileptic seizure group, CPA; cerebellopontine angle

가
가 , 1984 1999
가 435
(epileptic seizure group; ESG) (non-epileptic seizure group; NESG)

Table 4. Pathology and location of brain tumors in the patients with epilepsy

	CESG (%) (n=43)	AESG (%) (n=56)	P value*
Pathology of the tumor			
Glioblastoma multiforme	5 (11.6)	19 (33.9)	0.131
Astrocytoma	24 (55.8)	20 (35.7)	
Ependymoma		1 (1.8)	
Oligodendroglioma	5 (11.6)	10 (17.9)	
Meningioma	2 (4.7)	1 (1.8)	
Schwannoma		1 (1.8)	
Teratoma		1 (1.8)	
DNET	1 (2.3)		
Ganglioglioma	1 (2.3)		
Harmatoma	1 (2.3)	1 (1.8)	
Mixed	4 (9.3)	2 (3.6)	
Location of the tumor			
Cortical lesion	40 (93)	47 (83.9)	0.422
Frontal	16 (37.2)	14 (25.0)	0.495
Temporal	10 (23.3)	9 (16.1)	
Parietal	1 (2.3)	9 (16.1)	
Occipital	1 (2.3)	2 (3.6)	
Adjacent 2 more cortex	11 (25.6)	12 (21.4)	
Bilateral cortex	1 (2.3)	1 (1.8)	
Posterior fossa		1 (1.8)	
Suprasella	1 (2.3)	1 (1.8)	
Multiple	2 (4.7)	5 (8.9)	
Combined		2 (3.6)	

*chi-square test, AESG; acute epileptic seizure group, CESG; chronic epileptic seizure group, DNET; dysembryoplastic neuroepithelial tumor

37 (66.1%) , CESG 13 (30.2%) 2 AESG가 (p<0.05). 86 CESG가 40 , AESG 46 . CESG가 10 , AESG 40 CESG가 16 (40%), 5 , 가 6 AESG 24 (60%) (Fig. 1). 40 , 2 가 (presurgical MRI AESG가 16 (40%) CESG 가 1 (2.5%) (p<0.05)(Fig. 2). 86 23 CESG가 11 (26.24%), AESG 16 CESG가 15 (17.4%) AESG 8 (9.3%) (28.6%) , CESG가 7 (16.3%), (p<0.05)(Fig 3). AESG 12 (21.4%) (Table 3). CESG AESG 9 , 5 , 4 AESG CESG 가 15.25 , 7.75 가 가 (Table 4). CESG가 24 , 5.56 , 3.26 AESG 36 , CESG 가 (p<0.05). CESG 가 19 , AESG 20 5 가 3

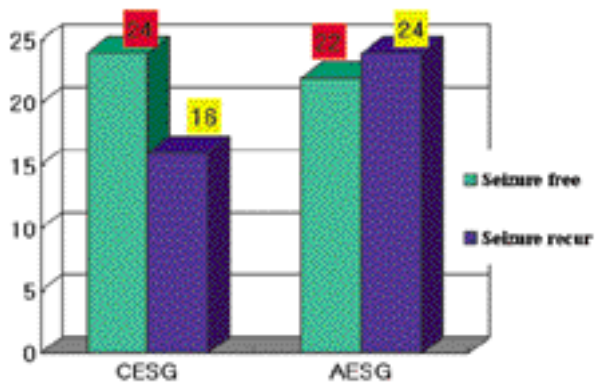


Figure 1. Postoperative prognosis of epilepsy in patients with brain tumor. There are not significant differences in the seizure free rate postoperatively between CESG and AESG. The data analysis was done by chi-square test. CESG; chronic epileptic seizure group, AESG; acute epileptic seizure group.

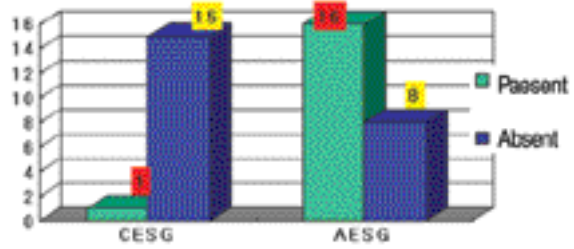


Figure 2. Tumor residue or recurrence on follow-up MRI of patients with postoperative seizure recurrences. AESG have more tumor residue or recurrence significantly than CESG on follow-up MRI. The data analysis is done by chi-square test. CESG; chronic epileptic seizure group, AESG; acute epileptic seizure group.

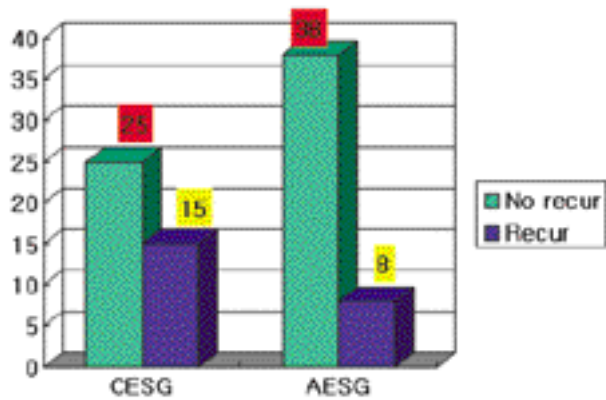
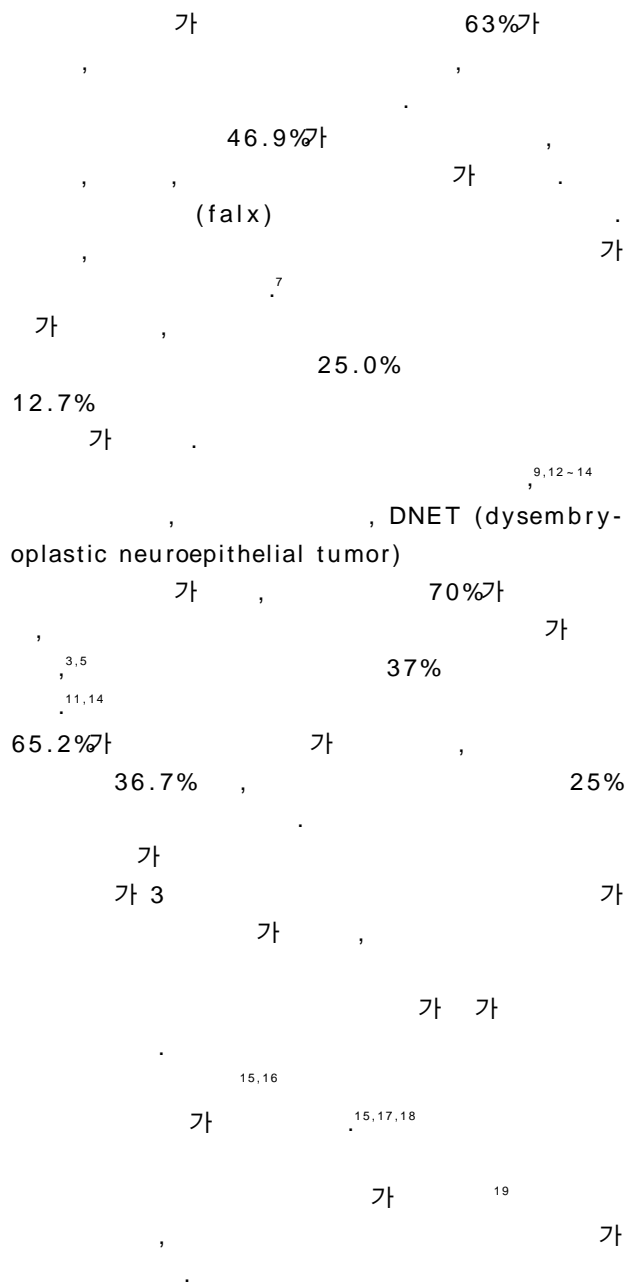


Figure 3. Postoperative prognosis of epilepsy in brain tumor patients without residue or recurrence. CEGS have more recurrence rate of seizure significantly than AESG without residue or recurrence in the follow-up MRI. The data analysis is done by chi-square test. CEGS; chronic epileptic seizure group, AESG; acute epileptic seizure group.



(1.9%)

가 가 가

가 가 .¹⁹ 가 가 AESG CESH

3 CESH AESG ,

가 가

(10~46%)²⁶ , ,
6 ,
3,8
AESG CESH

.¹⁸ DNET 가 가 AESG CESH
가 가 CESH

. Wolf ²⁰ DNET 가 가 가
NR1(N-methyl-D-aspartate receptor unit 1),
GABAR(alpha 1 subunit of GABA receptor),
GAD(glutamate decarboxylase), calretinine, par-
valbumin, somatostatin, TH(tyrosine hydroxy-
lase) , ,
27,28 ,
20,29 ,
30,31 ,

.^{21,22} CESH DNET 가 가
1 CESH Strowbridge ²⁸
31 가
all or none ,

가 CESH AESG 2 GABA
Williamson²⁷ 가 65%가,
10%가 가 가
가 가 가
24 , 25 , 23 ,
74%, 51% , GABA 가
AESG CESH 12 .²⁹

(post-traumatic epilepsy) 가 가 가
1 가 가 가
1 CESH MRI

95% , 1 가

AESG MRI 57.5% , 20% 22.5%가

CESG 가 CESG가 40% AESG 60% MRI

CESG 17.4% AESG 9.3% 2 CESG가

가 MRI

18.8 ~ 50% 가 , 90%

가, 가

Penfield

2,6,19,32,33 가

CESG 가 가

가 가

가 가

MRI 가

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