

**RESEARCH/PROJECT NAME:** Glioma Associated Epilepsy (GEA)

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**BACKGROUND:** Seizures are presenting sign in 25-50 % of gliomas. All tumor associated epilepsy "TAE" has significant morbidity and loss of quality of life (QOL). Improving control of TAE, especially the gliomas may improve QOL and Karnofsky Performance Scores (KPS). Impact of "glioma associated epilepsy" (GAE) on morbidity of all tumor types is significant (1).. In GAE seizure outcome may be related to multiple variables, e.g. WHO classification, extent of resection, treatment modalities, anti-epileptic drugs (AED), EEG findings and Karnofsky Performance Status (KPS) scores (Table 1).

(1)Reference: Shete et al. American Association for Cancer Research, 71: 7568-7575, 2011

**METHODS:** Retrospective chart review study using data from Univ of Minnesota Tumor Conference and Medical Records on 219 subjects with gliomas and epilepsy seen between 2006-2013 at the University of Minnesota Neurosurgery/Neurology Departments was done.(Table 2) Analysis of variables using chi square testing and p values was performed.

We investigated **the association** of seizure outcome (Engel's scale) at patients last Neuroncology/ Neurosurgery Clinic visit using Engel's classification I-IV and KPS scores, with multiple clinical variables as described in Table 1.

**RESULTS:** In patients with **KPS score of less than 80**, their mean age $\pm$ SD was 50 $\pm$ 16 years (p=0.003) and 57.3% were males (p=0.3).

In 38.8% of these patients with KPS <80 the tumor was located in the frontal region. (p=0.004) 32.5% of the patients had low grade gliomas\* (p=0.001).

EEG was abnormal in 20.5% (p=0.2) and mortality in this group was 25.6% (p=< 0.001).

Patients with **KPS score of  $\geq$ 80**, mean age $\pm$ SD was 43 $\pm$ 15 (p=0.003) years and 64.0% were males (p=0.3). Tumor location was frontal in 61.6% (p=0.004). 55.6% of the patients had low grade\* (p=0.001). EEG was abnormal in 13.1% (p=0.2).

Overall, 20% had oligodendroglioma with 1p19q deletions. (Table 1)

3% had positive family history of glioma.

**Engel's seizure data:**The patient with gliomas who presented with seizure were 35%. Correlation of variables with seizure control is in table 1.

67% of all patients were on monotherapy, Levetiracetam,while 23% were on combination therapy. (Table 2)

\*Low grade glioma= WHO I & II

**CONCLUSIONS:** Clinical variables traditionally used to predict epilepsy outcome, measured by functionality, KPS score and Engel's seizure control, in GAE in this series of 219 patients had statistically

significant association. Further studies are needed to look at other clinical parameters, perhaps molecular genotypes that may also correlate with outcome in so far as seizure and KPS scores.

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Table 1:

Characteristics	Overall no (%)	Characteristics	Overall no (%)
<b>Age</b>		<b>Family hx of glioma</b>	
0-19	9(4.1)	No	514 (97.7)
20-39	62(28.3)	Yes	5(2.3)
40-59	93(42.5)	<b>AED</b>	
60-79	53(24.2)	Single Therapy	147(67.1)
80-99	2(0.9)	Combination	56(25.6)
<b>Sex</b>		<b>Radiation</b>	
Female	88(40.2)	Yes	172(78.5)
Male	131(59.8)	No	47(21.5)
<b>WHO Grade</b>		<b>Extent of Resection</b>	
I	12(5.5)	Not Available	87(39.7)
II	81(37.0)	Subtotal	44(20.1)
III	52(23.7)	Total	46(21.0)
IV	73(33.3)	Not Done	42(19.2)
<b>Location</b>			
Frontal	106(48.4)	<b>KPS Score</b>	
Temporal	40(18.3)	Less than 80	117(53.4)
Parietal	22(10.0)	80-100	100(45.7)
Occipital	5(2.3)	<b>KPS Score (3 strata)</b>	
Mixed	24(11.0)	40 or less	59(26.9)
Intraventricular	5(2.3)	50-70	58(26.5)
Others	16(7.3)	80-100	100(45.7)
<b>Presenting with Seizures</b>		<b>Engel Classification</b>	
Yes	77(35.2)	I	129(58.9)
No	137(62.6)	II-IV	90(41.1)
<b>1p 19q-Deletion</b>			
No	175(79.9)		
Yes	44(20.1)		

Table 2:

	Karnofsky Performance Scale			Engle Seizure Outcome		
	<80	>80	P-Value	I-II	III-IV	P-Value
Overall No. (%)	117	100		168	51	
Age (mean±SD)	50±16	43±15	0.003	47±15	47±17	0.8
0-29	13 (11.1)	19 (19.0)	0.02	26	6	0.8
30-50	43 (36.8)	46 (46.0)		70	20	
60 and above	38 (32.5)	17 (17.0)		41	14	
Gender						
Female	50 (42.7)	36 (36.0)	0.3	65 (38.7)	23 (45.1)	0.4
Male	67 (57.3)	64 (64.0)		103 (61.3)	28 (54.9)	
Location						
Frontal	45 (38.8)	61 (61.6)	0.004	85 (50.6)	21 (41.2)	0.3
Temporal	21 (18.1)	18 (18.2)		33 (19.6)	7 (13.7)	
Parietal	17 (14.7)	5 (5.1)		13 (7.7)	9 (17.6)	
Occipital	5 (4.3)	0 (0.0)		3 (1.8)	2 (3.9)	
Mixed	18 (15.5)	6 (6.1)		17 (10.1)	7 (13.7)	
Intraventricular	2 (1.7)	3 (3.0)		3 (1.8)	2 (3.9)	
Other	7 (6.0)	6 (6.1)		10 (6.0)	3 (5.9)	
Histologic Grade						
Low (WHO Grade I&II)	38 (32.5)	55 (55.6)	0.001	72 (42.9)	21 (41.2)	0.8
High (WHO Grades III&IV)	79 (67.5)	44 (44.4)		95 (56.5)	30 (58.8)	
Radiation						
No	23 (19.7)	24 (24.0)	0.4	35 (20.8)	12 (23.5)	0.7
Yes	94 (80.3)	76 (76.0)		133 (79.2)	39 (76.5)	
Resection						
Not done	18 (15.4)	23 (23.0)	0.09	29 (17.3)	13 (25.5)	0.2
Subtotal	29 (24.8)	14 (14.0)		35 (20.8)	9 (17.6)	
Total	24 (20.5)	22 (22.0)		39 (23.2)	7 (13.7)	
EEG recording						
Not Done	66 (56.4)	68 (68.7)	0.2	110 (65.5)	26 (51.0)	0.007
Normal	27 (23.1)	18 (18.2)		36 (21.4)	9 (17.6)	
Abnormal	24 (20.5)	13 (13.1)		21 (12.5)	16 (31.4)	
Mortality	30 (25.6)	0 (0.0)	<0.0001	20 (11.9)	10 (19.6)	0.2