

Time to Detection of Seizures Among Hemorrhagic and Ischemic Stroke Patients Undergoing Continuous (cEEG) Monitoring



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PRESENTER DISCLOSURE INFORMATION

- Financial Disclosure
 - None
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 - None

BACKGROUND

- Studies have been done to identify the time duration for which patients should undergo continuous electroencephalogram monitoring before seizures may be excluded.
- Stroke patients may undergo continuous electroencephalogram (cEEG) monitoring if seizures are suspected.
- However, It is unclear how long cEEG monitoring should be done in hemorrhagic and ischemic stroke patients in order to exclude subclinical seizures.

OBJECTIVES

- We aimed to identify the patient population among hemorrhagic and ischemic stroke patients that is at risk of delayed seizure detection.
- And therefore, may benefit from prolonged cEEG monitoring in comparison to other patients.

METHODS

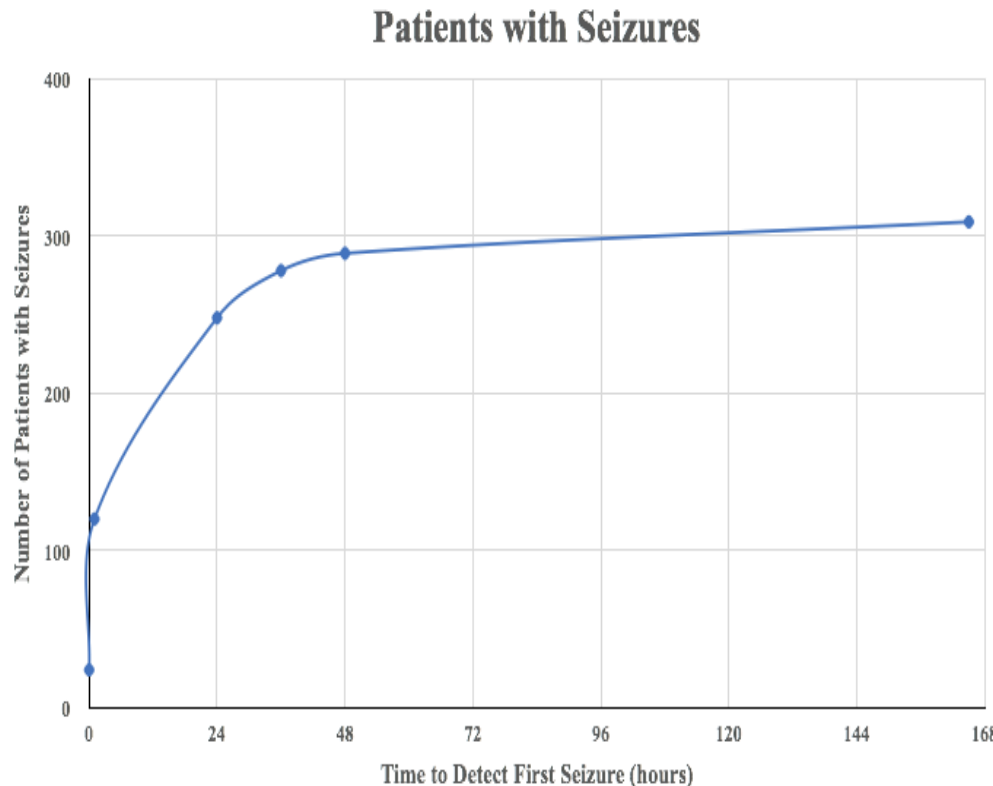
- We identified all admitted patients who underwent
 - cEEG monitoring
 - at Cleveland clinic
 - between January to December, 2016
 - 2425 total patients.
- Baseline demographic, clinical, and EEG findings were recorded.
- Data Analysis
 - Wilcoxon Rank sum Test.
 - Chi squared test

RESULTS

- All Patients monitored with EEG: 2425 patients
- Patients with seizures: 334 (13.8 %)
 - Status Epilepticus on EEG: 46 (13.8%)
 - Excluded: 25 because of missing data.
 - Included: 309
 - Median time to seizure onset: 3 hours.
 - Range: 0 to 165 hours (6 days 21 hours).

SEIZURE DETECTION ON EEG

- At the onset of EEG : 24 (7.8 %)
- Within 1 hour: 120 patients (38.8 %)
- Within 24 hours: 248 (80.3%)
- Within 36 hours: 278 (90 %)
- Within 2 days (48 hrs): 289 (93.5 %)
- 1st seizure after 48 hours: 20 (6.5 %)
- Depending on etiologies, some patient populations were more likely to have delayed onset of seizure.



RESULTS

- Patients were divided into vascular and non-vascular etiologies.
- Vascular etiologies were further subdivided into ischemic stroke, hemorrhage and PRES
- Hemorrhages were further subcategorized into various types
- Patients with seizures due to hemorrhage: n=60 (19%)
- Seizures due to ischemic strokes: n=41(13%)

Table 1: Recording of seizures among various Etiologies and Delayed recording of first seizure

	Number of patients with seizures: n=309	Seizure detection on EEG >24 hours		
		Yes, n=61	No, n=248	p
Non Vascular Etiologies	203	35 (17%)	168 (83%)	0.1052
Vascular Etiologies				
Ischemic stroke	41	7 (17%)	34 (83%)	0.539
PRES	5	1 (20%)	4 (80%)	0.5207
Hemorrhage	60	18 (30%)	42 (70%)	0.0221

RESULTS

- Hemorrhage patients were more likely to have their first seizure recorded after 24 hours of monitoring ($p=0.0221$).
- Hemorrhages were subdivided into subdural, subarachnoid, parenchymal, epidural and mixed.
- Among these, those who had more than one type of hemorrhage were more likely to have their first seizure detected after >24 hours of cEEG monitoring ($p=0.0002$).

Table 2: Recording of seizures among hemorrhagic stroke patients and delayed recording of first seizure

	Number of patients with seizures	Seizure Detection on EEG after 24 hours		p
		Yes	No	
Total hemorrhages	60	18 (30%)	42 (70%)	0.0221
SAH	7	2 (29%)	5 (71%)	0.54
SDH	15	5 (33%)	10 (67%)	0.17
ICH	26	4 (15%)	22 (85%)	0.56
Mixed (more than 1 type of hemorrhage)	11	7 (64%)	4 (36%)	0.0002
Epidural hematoma	1	0 (0)	1 (100%)	0.62

RESULTS

- Among ischemic strokes who were to eventually have seizures, seizures were detected by
 - 2 hours 17 minutes in 50%: median time to seizure detection
 - 18 hours in 80%
 - 34 hours in 90% of patients.
- However, for hemorrhage patients with seizures, time to seizure detection was
 - 15 hours in 50 %($p= 0.0004$): median time
 - 33 hours in 80%
 - 41 hours in 90 % of patients.

RESULTS

Etiology	Median time to seizure onset (hours)	P-value (for median time to seizure onset)	Time to detect seizures among 80 % of pts (hours)	Time to detect seizures among 90 % of pts (hours)
All Patients	3.02		24	36
Hemorrhage	14.60	0.00004	32.18	40.56
Ischemic Stroke	2.283	0.89	18.01	33.65
PRES	1.167	0.89	12.54	24.02
Mental Status				
Awake	3.08	0.92	17	29
Lethargic	2.92	0.33	28	42
Stuporous	5.28	0.13	29	79
Comatose	0.20 (12 min)	0.0035	16	40

RESULTS

- Comatose patients were more likely to have early onset of seizures compared to noncomatose patients (median: 12 min, P value 0. 0035).
- Among awake, lethargic and comatose patients, seizures were detected in less than 2 days of cEEG monitoring in 90% of patients
- As against more than 3 days of cEEG monitoring required to detect seizures in 90% of stuporous patients.

RESULTS

Mental status	Number of patients with seizures (309)	Seizure Detection on EEG after 24 hours		
		Yes, n=61	No, n=248	p
Awake	126	20 (33)	106 (43)	0.156
Lethargic	79	19 (31)	60 (24)	0.261
Stuporous	59	15 (25)	44 (18)	0.216
Comatose	45	7 (11)	38 (15)	0.424

CONCLUSION

- Patients with seizures secondary to hemorrhage particularly those who have more than one type of hemorrhage concomitantly are more likely to have delayed detection of seizures.
- Hence this patient population requires longer cEEG monitoring greater than 24 hours to detect seizures
- Further studies are needed to assess if other factors such as other EEG findings (PLEDs, sharp waves, periodic pattern etc) can further help in decisions regarding the duration for EEG in hemorrhage and ischemic stroke patients

QUESTIONS?

THANK YOU!