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Epileptic activity in neurological deterioration after ischemic stroke, a cEEG study

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BACKGROUND

- Neurological deterioration (ND) after ischemic stroke (IS) occurs in up to 38% of cases
  - Four-fold increase in death or dependecy
  - In 50% of cases etiology is not clarified

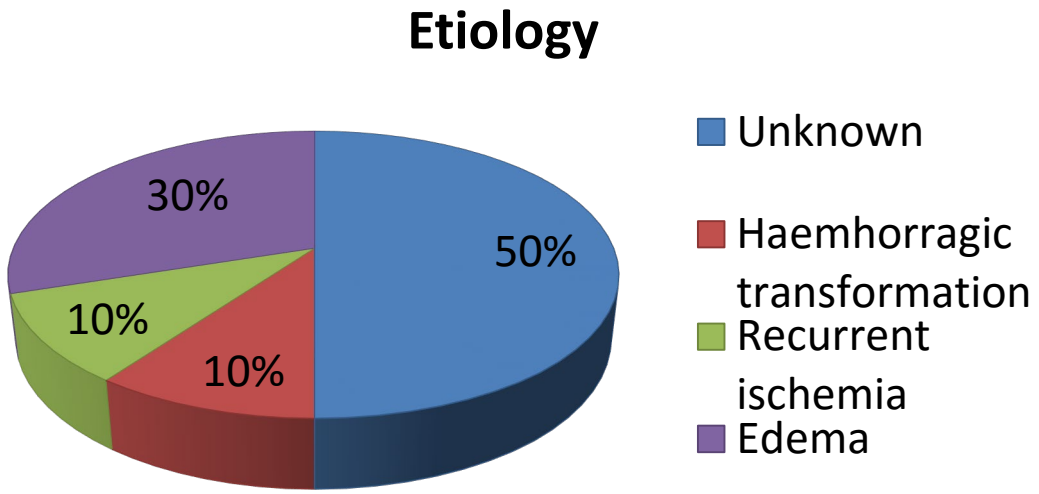
Seners et al., 2014, 2018

- Epileptic activities (EA) are described after IS as following acute brain injuries (SAH, TBI, ICH) and severe systemic diseases
  - Up to 90% are non-convulsive
  - Associated with changes in brain metabolism defined as “metabolic crisis”
    - Increased neuronal oxygen and metabolite needs, CBF, IP, LPR

Ko et al., 2013, Claassen et al. 2014, De Marchis et al. 2016

- **PRIMARY ENDPOINT :**

Could EA contribute for a substantial amount (50%) of unexplicated ND after IS?



- cEEG were retrospectively reviewed:
  - To asses prevalence and type of epileptic activities
  - Impact of treatment with AED

METHODS

cEEG recordings (N=1247)
1/2014-12/31/2016

Acute ischemic stroke
(N=81 [6%])
(Total admission for acute ischemic stroke = 1247)

Neurological deterioration
(N=81)

New clinical symptoms not attributable to the topography of ischemic stroke

Study population

ΔNIHSS ≥2

Alteration of consciousness defined as fluctuating mental state

- Demographic data
- Stroke characteristics
- Past medical history
- Medical treatement
- Latency to cEEG
- Clinical outcome at 3-months

RESULTS

Demographic and clinical characteristics.

Variable	Entire cohort ($N = 81$)
Age	71 [63–80]
Gender, male	46 (56%)
NIHSS	11 [5–19]
Outcome (mRS)	
0–1	15 (19%)
2–5	30 (37%)
6	36 (44%)
TOAST Classification	
Large artery	22 (27%)
Cardioembolic	36(44%)
Lacunar	1 (1%)
Cryptogenic	11 (14%)
Other	11 (14%)
Localisation	
Anterior	
Cortical	57 (70%)
Sub-cortical	58 (72%)
Posterior	
Cortical	33 (41%)
Sub-cortical	27 (33%)
Stroke treatment	
rtPA only	23 (28%)
Thrombectomy only	18 (22%)
rtPA + Thrombectomy	10 (12%)
None	30 (37%)

EEG Abnormalities	N=	%
Encephalopathy		
Mild	57	70%
Moderate	24	30%
Severe	0	
Lateralized/focal slowing	55	68 %
Concordant with stroke side	48/55	87%
Lateralized/focal attenuation	50	61.7%
Concordant with stroke side	45/50	90%
Epileptic activities	36/81	44 %
SEDs only	14/81	17%
Either PDs or NCSz/NCSE	22/81	27%
NCSz	10	12%
NCSE	4/10	40%
Focal	8/10	80%
Periodic discharges (PD)	17	21%
Generalized	6	7.4%
Multifocal	1	1.2%
Lateralized	10	12.3%

Outcome:

No differences in mRS between:

- patients with NCSE/NCSz/PDs vs controls (p = 0.65)
- patients who had AED vs no treatment (p = 0.57)

DISCUSSION

- High prevalence of EA after IS and worse prognosis/increase long-term risk of seizures associated with them
- Metabolic disturbances after ischemia concur in EA genesis and EA, in turn, lead to increased stress on the viable penumbra by increasing of O_2 consumption, CBF, IP and LPR. These “metabolic crisis”:
  - Worsen cerebral lesion
  - Increase mortality and morbidity in SAH, ICH, TBI and critically ill patients
- Lack of recanalization is the trigger of a vicious circle
- AED treatment led to disappearance of NCSz/NCSE and PDs in 80% and 62% respectively: adverse metabolic consequences of EA could be partly prevented when those patterns are detected and treated.

LIMITATIONS OF THE STUDY

- Higher mortality (44%) compared to natural history of stroke (7-23%)

Wei et al., 2018; Feigin et al. 2003

- 7% of our stroke cohort experimented ND: probably only severe cases benefited from cEEG
- Similar mortality rate to other ND cohort

Kwan et al., 2006; Siegler et al., 2016

- Limited sample to demonstrate a difference in clinical outcomes

CONCLUSIONS

- cEEG monitoring in IS with ND detects epileptic activities in 44% of cases
  - 12% are NCSz/NCSE
  - 21% PDs
- This effect on ND is likely to occur through “metabolic crisis” induced by silent neuronal discharges generated by neurons that suffered from ischemia
- Treatment of NCSz/NCSE and PD may have a role in post-stroke neuroprotection

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Epileptic activity in neurological deterioration after ischemic stroke, a continuous EEG study

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HIGHLIGHTS

- Epileptic activities (EA) are found in 4
- Ictal patterns and Periodic discharges
- Treating ictal patterns and PDs could

ABSTRACT

Objective: Despite improvement in acute s
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Thank you for your attention