Seizures and Epilepsy in the Setting of Stroke

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Introduction

- Epileptic seizures in the setting of stroke
- *Epilepsy* in post-stroke population
- *Status epilepticus*
- Diagnostic studies
- Treatment
Case #1

62 year old with atrial fibrillation presents with sudden onset left face and arm weakness. A CT scan is done which is normal, but while in the scanner he has a “generalized convulsion”. He is subsequently diagnosed with a right MCA territory stroke.

-What is the treatment for his seizure?
-Does he now have epilepsy? What is his risk of developing epilepsy?
-Should he be discharged on antiepileptic medication?
-How long should he be on antiepileptics?
71 year old lady who suffered a right occipital stroke 4 months ago, with residual visual field defect, now presents with an episode described as seeing flashing lights to her left, followed by shaking of her left arm, head turning to the left and then whole body shaking for three minutes.

- What is the treatment for her seizure?
- Does she now have epilepsy? What is her risk of developing epilepsy?
- Should she be started on antiepileptic medication now?
- How long should she be on antiepileptics?
Post-Stroke Seizures

• Acute Symptomatic
  *Epileptic seizures within **24 hours** after onset*

• Early Post-Stroke
  *One *or more* seizures within the **first week***

• Late Post-Stroke
  *One *unprovoked* seizure *after the first week***
Post-Stroke Epilepsy

Two or more *unprovoked* seizures occurring at least one week after the onset of stroke
Incidence

• Inconsistent terminology and methodology makes data hard to interpret (Slapø, 2006)

• Reported from 2.3% to 43%! (Lossius, 2002)
  • Oxfordshire Community Stroke Project 7.7% (Burn et al, 1997)
  • SASS study – 8.9% (Bladin et al, 2000)
  • ESPro study – 8.2% (Jungenhulsing et al, 2013)
Incidence

• Hemorrhagic strokes are more associated with seizures (Lossius, 2002; Reith et al, 1997)

• One third of the seizures are **acute symptomatic**
  • **Much higher 30-day mortality**
    • 41% versus only 5% for late seizures (Hesdorffer, 2009)
Predictors of Epilepsy

- **LATE** post-stroke seizure
  - 50% - 70% are recurrent → Epilepsy as defined

- **LARGE** stroke

- **Hemorrhagic** stroke

- **Cortical involvement**

  (Berges, 2000; Lossius, 2002; Hesdorffer, 2002; Kamersgaard, 2005)
Predictors of Epilepsy

• “Island of spared cortex”
• Stroke with irregular border
• Occipital involvement, low Rankin score

(De Reuck, 2000)
Case #3

64 year old man presents with sudden onset right sided weakness and change in mental status. His MRI is shown:
Case #3

4 days after admission he continues to be obtunded, with fluctuating level of alertness.
EEG – PLEDs in the right posterior region
EEG – 2-3 seizures / hour
Status Epilepticus

- Stroke (early and remote) is the second most common cause of status epilepticus
  (Shorvon, 2010)
- Occurs in ~1.5% of all new stroke cases
  (De Reuck, 2009)
- 10% of all early onset post-stroke seizures
  (Velioglu, 2001)
Status Epilepticus

• High risk of death within 3 years
  (Knake, 2006)

• Associated with worse rehabilitation prognosis
  (De Reuck, 2009; Velioglu, 2001)

• Does not predict recurrence or development of subsequent epilepsy
  (Rumbach, 2000)
Status Epilepticus

- **NON-CONVULSIVE** status epilepticus is more common than previously suspected.

- One study showed that 85% of SE in acute symptomatic post-stroke seizures were non-convulsive.

  (Afsar, 2003)
Status Epilepticus

Risk factors:

• **LARGE** stroke / high NIHSS

• **Hemorrhagic** stroke

• Cortical involvement

• Posterior circulation
EEG

• Does routine EEG help predict acute symptomatic or late seizures?
EEG

- NORMAL EEG → low risk of seizures or epilepsy

- Abnormal EEG:
  - Epileptiform findings: PLEDs, sharp waves
  - Non-epileptiform: FIRDA, focal slowing
EEG

- PLEDs
  - associated with incidence of seizures
  - not associated with subsequent epilepsy
  - recorded in a small number of patients
    (5.8% of patients who then developed seizures, DeReuck 2000)
EEG

- FIRDA and slowing
  - associated with incidence of seizures
  - associated with subsequent epilepsy
Continuous EEG

• Recommended in comatose patients with brain injury (stroke, TBI, ICH)
  (Claassen, 2013 / ESICM guidelines)
Continuous EEG

Continuous assessment of electrical epileptic activity in acute stroke (Carrera et al, 2006)

• 100 patients with acute stroke
• 17 had epileptiform discharges on cEEG
• 2 patients had electrographic seizures

• NIHSS score – the only predictor of epileptiform discharges or seizures
Continuous EEG

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Continuous EEG

- Should be considered in acute stroke patients with impairment of consciousness
- Would consider in high NIHSS, cortical infarct, PCA territory, hemorrhagic stroke
Treatment

• Controversial
Treatment

• Early seizures
  • Risk of recurrence similar to *single seizure* and *normal imaging*

• Treat? How long?
Treatment

• Early seizures
  • Despite lack of data most physicians treat post stroke seizures

• The need for chronic anticonvulsant use should be evaluated periodically, perhaps every 6 months.

(Broderick, 1999; Mayberg, 1994, Silverman 2002)
Treatment

• Late seizures
  • High risk of recurrence

• Some advocate treatment even after a single late seizure, whereas others prefer treating after a second late unprovoked seizure

(Slapo, 2006; De Reuck, 2009; Ryvlin, 2006)
Treatment

• Late seizures
  • Decision should be individualized
    • primarily based on the functional impact of the first seizure episode and the patient's preference

(Ryvlin, 2006)

• Usually well controlled on monotherapy
Treatment

• Choice of AED

• There is data suggesting first generation AEDs (phenytoin, carbamazepine, phenobarbital etc.) worsen functional recovery in stroke (Brailowsky, 1986)

• Elderly patients on multiple medications – risk of drug interactions
Treatment

• Choice of AED
  
• One prospective RCT showed lamotrigine and gabapentin were equally effective as carbamazepine but better tolerated (Rowan, 2005)
  
• Valproate may promote repair and neurogenesis (Liu, 2012; Wang, 2012)
Conclusions

• Large stroke +/- impaired consciousness → Consider non-convulsive status

• Early seizure → low risk of recurrence / epilepsy

• Early seizure → higher mortality / poorer prognosis

• Late (>1 week) seizure → high risk of epilepsy

• Treat with newer generation anticonvulsants
Thank You