Neurologic Emergencies
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Purpose of Today’s Discussion
• Understand 2 Neurologic Emergencies
  • Status Epilepticus
  • Stroke in Children
• Know how to recognize and manage them

What is Status Epilepticus?
• Non Convulsive Status Epilepticus, seems to be under recognized
  • In a Canadian hospital 493 patients with diminished level of responsiveness 42 were in non convulsive-status (adults)
  • Found using continuous EEG
  • Most commonly in hypoxic injury, 2nd intracerebral hemorrhage, 5th was viral encephalitis
  • European Journal of Epilepsy 2005 16(1) 38-42

How do I recognize Status Epilepticus?

Disclosures
• Nothing to Disclose
How do I recognize Status Epilepticus?

- Convulsive: Stiff body with eyes rolled upward and dilated pupils
- Non Convulsive: Unexplained prolonged unresponsiveness

How do I treat Status Epilepticus?

- Endpoint: Seizure stopped after 20 min, did not recur for 60 min
- In Adults 1998 VA Cooperative study (multicenter)(570 pts)
  - Compared
    - Lorazepam (0.1 mg/kg)
    - Diazepam followed by Phenytoin (0.15mg/kg then 18 mg/kg)
    - Phenytoin (18 mg/kg)
    - Phenobarbital (18mg/kg)
    - Lorazepam had the best outcome

How do I treat Status Epilepticus?

- Out of hospital Paramedic study (adults)
  - Compared
    - Lorazepam: 2mg
    - Diazepam: 5
    - Placebo
  - Able to repeat once, Considered successful if seizure stopped before arrival
    - Lorazepam (59.1% > placebo 21.1%)
    - Diazepam (42.6% > placebo 21.1%)

How do I treat Status Epilepticus?

- RAMPART study (multicenter, double blind) (adults and children) (Paramedics)
  - Compared (dosing standardized)
    - IM Midazolam
    - IV Lorazepam
  - Endpoint (no seizures when reaching hospital)
    - IM Midazolam was equal to IV Lorazepam

How do I treat Status Epilepticus?

- Pediatric arm of the RAMPART study
  - 120 children
  - Compared
    - IM Midazolam (10mg [5mg if 13-40 kg])
    - IV Lorazepam (4mg [2mg if 13-40 kg])
  - Lorazepam met outcome 71.7%, IM Midazolam 68.3%
How do I treat Status Epilepticus?

• Other drugs that have been studied:
  - Valproate IV
  - Midazolam buccal
  - Midazolam intranasal
  - Lorazepam rectal
  - Diazepam rectal
  - Phenobarbital IV
  - Phenytoin IV
  - Various combinations

How do I treat Status Epilepticus?

• Best evidence
  - Lorazepam IV
  - Diazepam IV
  - Midazolam IV, IM, Intranasal

How do I treat Status Epilepticus?

• Adverse Events
  - Lorazepam IV — 97 patients:
    - Hypoventilation 10%
    - Hypotension 32%
    - Cardiac Rhythm 2%
  - Diazepam IV — 95 patients:
    - Hypoventilation 13%
    - Hypotension 34%
    - Cardiac Rhythm 3%
  - Midazolam IM:
    - Sedation 10%
    - Hypoventilation 6%
    - Hypotension 1%

How do I treat Status Epilepticus?

• Second Step
  - Levetiracetam VS Phenytoin
    - Ongoing ECliPSE study in the UK
    - The PREDICT study in Australia and New Zealand (ongoing)
  - Thai study (only reported on Levetiracetam)
    - 50 participants (19 male, 31 female, 2 were entered twice)
    - Age 1 day to 18 years
    - Infusion rates from 2 to 66 mg/kg/min
    - Dose 20 mg/kg — 44 times; 10 mg/kg total — 8 times
  - Seizures stopped in 59.6% (European Journal of Pediatric Neurology Vol 19 (4) p429—434)

How do I treat Status Epilepticus?

• American Epilepsy Society Guideline
How do I treat Status Epilepticus?

- American Epilepsy Society Guideline

Summary

- What do I want us to do?
  - 1st examine and stabilize patient
  - 2nd Give IV Lorazepam 0.1 mg/kg IV max 4 mg or IM Midazolam (5 or 10 mg)
  - May give 2 doses
  - Monitor for hypotension and hypoxemia
  - 3rd Levetiracetam 60 mg/kg IV over 5 min
  - 4th Admit to PICU; arrange prolonged video EEG, Neurology consult called

Where is the stroke?

- 16 yo awakens 1am, nausea, vertigo, diplopia
  - Physical Exam: Large pupil on left
  - Function: cannot walk, w/o assistance
  - Had to crawl into family car
Stroke

- Dizziness, vertigo, facial pain, double vision, and difficulty walking are the most common initial symptoms. The facial pain can be quite bizarre with sharp jabs or jolts around the eye, ear, and forehead. Patients feel “seasick” or “off-balance” with nausea and vomiting. Objects appear double, tilted, or swaying. Along with gait imbalance, it becomes nearly impossible for the patient to walk despite good muscle strength.

Stroke in a 9 yo

- At school: could not walk well, dropped her books
- On the way home, could not talk to father
- Had to be helped into house
- Obvious speech problem, right sided weakness

Stroke in a 9 yo
Stroke in a 9 yo

-Began to run into walls when walking, tripped on things on his right.
-When riding his bike, he had to stop turning his head to the left more than 180 degrees.
-Almost rode bike in path of car coming from the right.
-Could not see objects in his right field.
Stroke in a 1 month old

- Congenital Diaphragmatic hernia
- ECMO
- Clotted ECMO catheter
- asymptomatic
Stroke in a 1 month old

- Common Heart Ventricle
- Cyanotic Congenital Heart Disease
- Began having seizures post-op
- No abnormality noted, child sedated

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Stroke in a 11 month old

- Healthy normal child
- Quit using left arm and leg
- Pediatrician saw child, called an Orthopedic problem
- Orthopedic physician called NSGY, who recognized stroke before even seeing the child
Stroke

- The association between infection and childhood stroke is increasingly recognized, with associations with sinusvenous thrombosis and childhood arteriopathy.

- The recommendation to screen for arteriopathy in genetic conditions such as sickle cell disease is now extended to include children with neurofibromatosis type 1.

Imaging Stroke

- Imaging
  - Diffusion weighted MRI may help to diagnose spinal cord [75] (Fig. 3), as well as intracranial, ischemic stroke, but there may be false-negative studies, predominantly in the brainstem, so follow-up imaging is required.
  
  - Arterial spin labeled perfusion MRI has been used in the pediatric stroke population.

Stroke

- Therapy
  - Rare use of tPA – have not been able to extrapolate optimal dosing from adults, and there are no RCT’s in children.

- Current standard is anti-platelet therapy.

Stroke

- Recognition is the key

- In Adults the Acronym FAST
  - Face Drooping
  - Arm Weakness
  - Speech Difficulty
  - Time to call 911

- In Children we have to consider it

- Hospitals with Stroke Protocols have better outcomes