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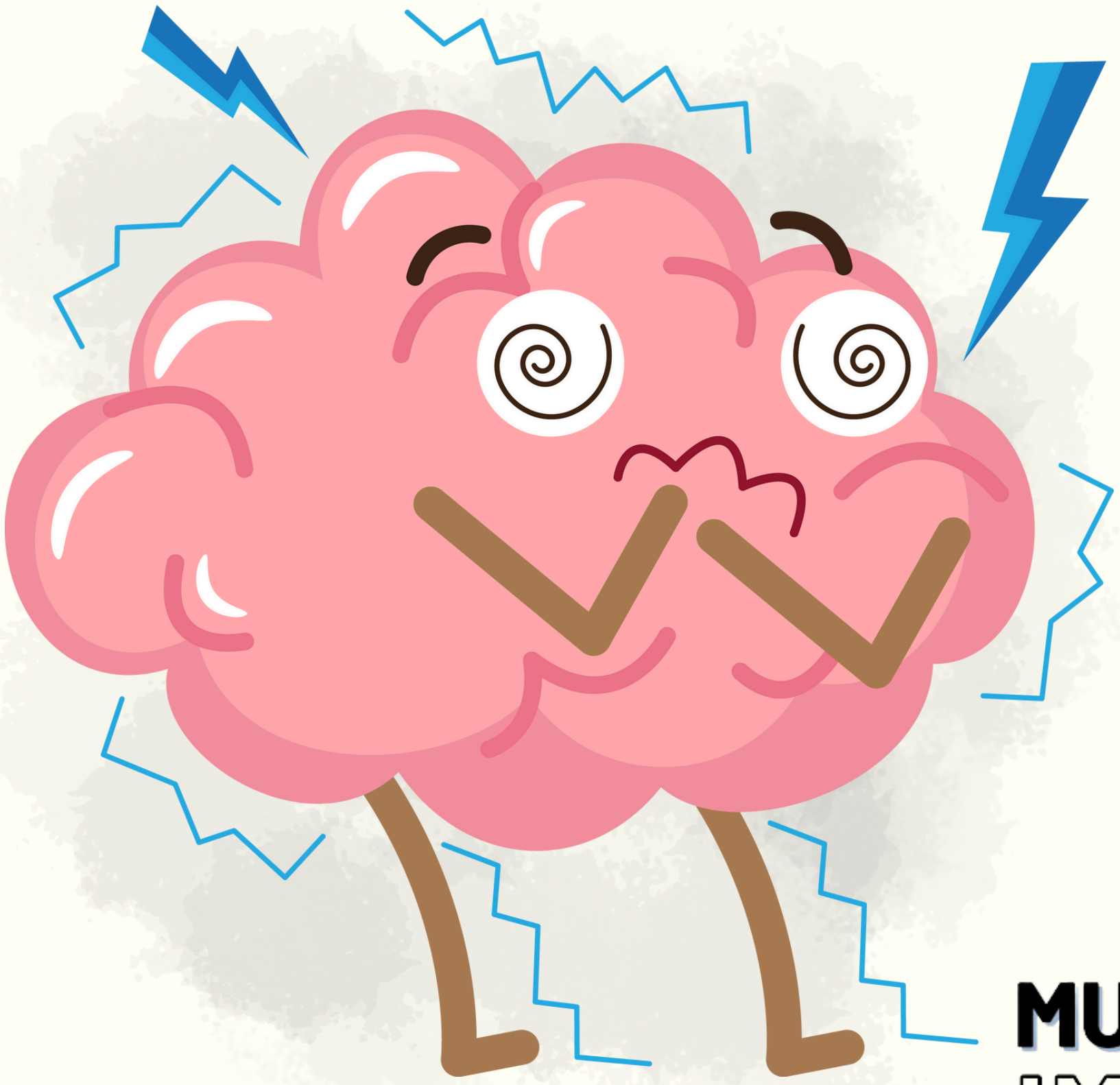
EPILEPSY

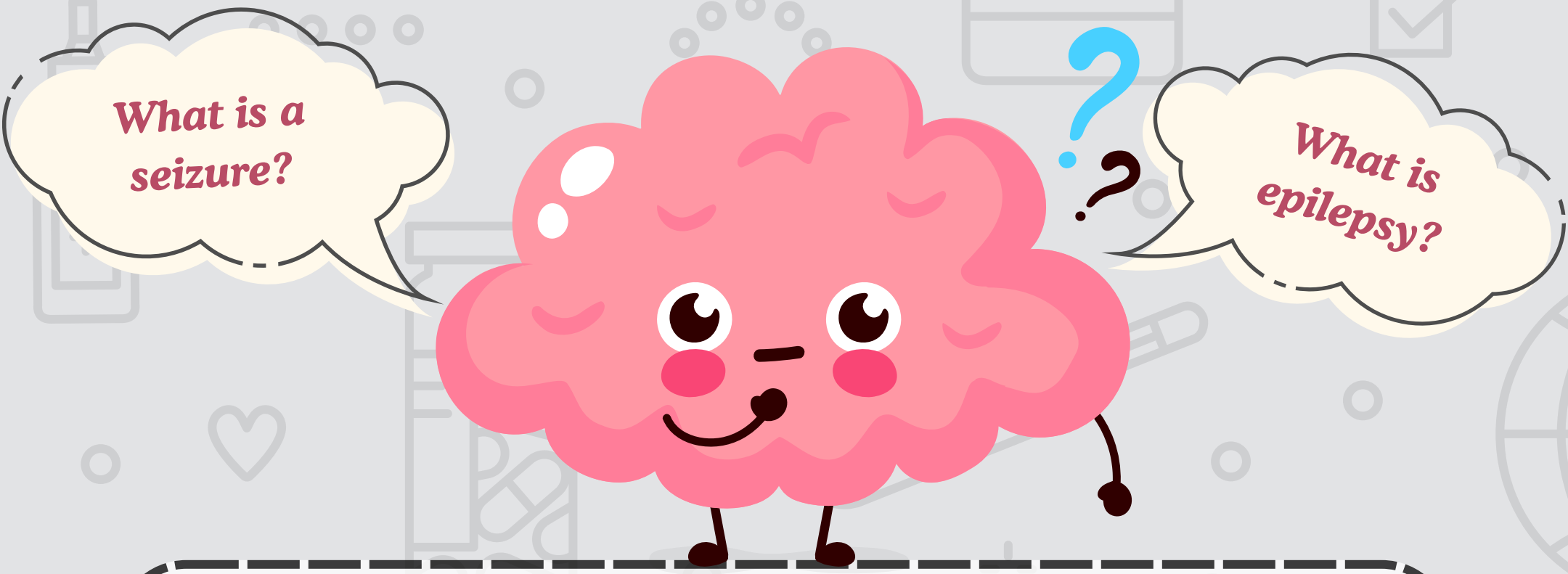
[PART 1: DEFINITIONS, CLINICAL FEATURES, INVESTIGATIONS]



MUM IMs

Definition

Seizure:
Occurrence of signs and/or symptoms due to a sudden synchronous discharge of cerebral neurons.



Epilepsy:

- *At least two unprovoked (or reflex) seizures occurring more than 24 hours apart*
- *One unprovoked seizure and ≥60% chance of further seizures over the next 10 years*
- *Diagnosis of an epilepsy syndrome*

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Aetiology

REMEMBER: VITAMIN D

Vascular → Cerebral infarct, Arteriovenous malformation
Infection → Meningitis, Encephalitis
Trauma → Brain trauma, Surgery
Autoimmune → NMDA receptor antibody, Potassium channel antibody encephalitis
/**A**lcohol withdrawal

Metabolic → Hyponatraemia, Hypocalcaemia
Idiopathic
Neoplasm → Intracranial tumour
Drug → Tricyclic antidepressants, Cocaine

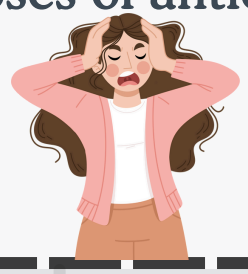
/**D**evelopmental → Neuronal migration abnormalities, Cortical dysplasia

Triggers

REMEMBER: SEIZURES

Sleep deprivation
Electrolyte and metabolic disturbances
Intercurrent infections
visuali**Z**ation disturbance (flickering light)

Undermedicated (missed doses of antiepileptic drugs)
Recreational drug misuse
ETOH (alcohol withdrawal)
Stress



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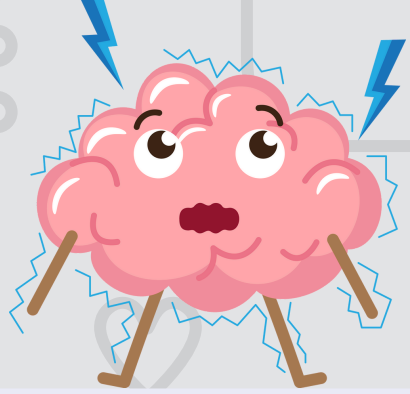
Classification



Features	Generalised	Focal
Origin	Both hemispheres simultaneously	A part of the cortex of one cerebral hemisphere
Awareness	Impaired	Simple: Aware Complex: Impaired
Onset	No warning	May be preceded by an aura that reflects site of origin
Spreads	Widespread	Restricted or spread after a few seconds to both hemispheres (focal to bilateral tonic-clonic)
Post ictal symptoms	Confusion 	Local paralysis
Types	1. Tonic-Clonic Seizures 2. Absence seizures 3. Myoclonic seizures 4. Tonic seizures 5. Atonic seizures	1. Motor onset 2. Non-motor onset 3. Focal to bilateral tonic clonic

Unknown: Insufficient evidence to characterise

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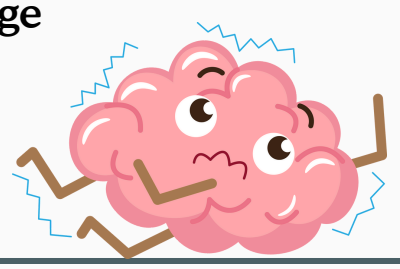
Generalised Seizures: Types and How They Present

Types	Features
Tonic–clonic seizures (grand mal) 	**Prodrome:** • No warning or aura **Tonic–clonic phase (~2 mins):** • Initial tonic stiffening → Synchronous limb jerking → Reduced frequency → Stop • Utter an initial cry → Fall → Injured • Opened eyes • Bitten tongue • Urine or faeces incontinence **Post-ictal phase (~ 15mins to >1hour):** • Gradual return of awareness • Confused and drowsiness • Flaccid • Headache 
Absence seizures (petit mal)	• Childhood • EEG: 3 Hz spike-and-wave discharge • Slight fluttering of the eyelids • < 10 seconds • Return abruptly to normal 
Myoclonic seizures	Brief contractions of a muscle or muscle groups
Tonic seizures	Body stiffening only
Atonic seizures	Sudden collapse with loss of muscle tone and consciousness

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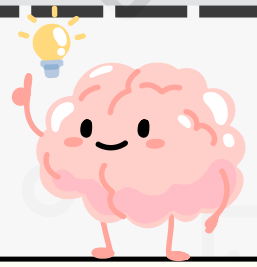
Focal Seizures: Match the Symptoms to the Brain Lobes



Frontal lobe

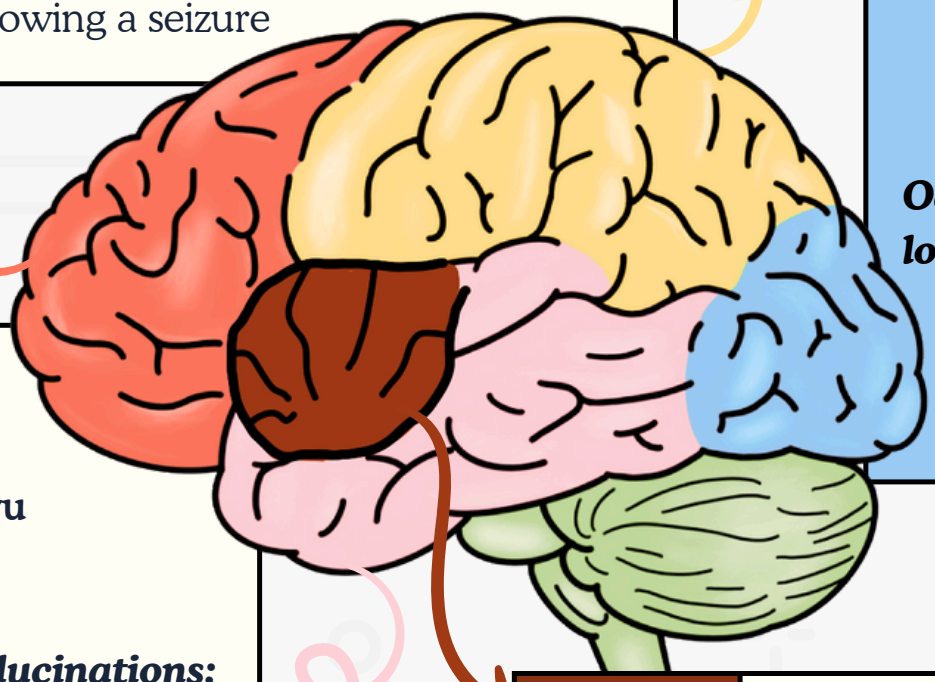
Motor:

- **Adversive seizure:**
  - Conjugate gaze deviates away from the focus
  - Head turns
- **Jacksonian seizure:**
  - Spread from a body part to the entire side
- **Todd's paralysis**
  - Local temporary paralysis of the affected limb following a seizure

Parietal lobe

Sensory:

- Numbness
- Parasthesia
- Pain



Occipital lobe

Visual:

- Zigzag lines
- Coloured scotoma
- Hemianopia
- Micropsia and macropsia

Temporal lobe

Psychic:

- Déjà vu
- Jamais vu
- Fear

Sensory hallucinations:

- Olfactory
- Gustatory
- Auditory

Visual:

- Macropsia
- Micropsia

Autonomic:

- Tachycardia
- Urinary urgency

Insular lobe

Sensory:

- Paraesthesia
- Cervicolaryngeal discomfort (dyspnoea, sensation of strangulation)

Motor:

- Hyperkinesia
- Chorea
- Dystonia

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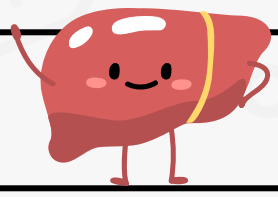
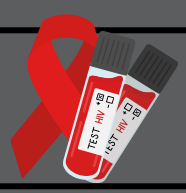
Investigation

RULE OUT UNDERLYING PROVOKING CAUSES !!!

Bedside test:

Electrocardiogram (ECG)	To rule out cardiogenic causes 

Laboratory test:

Urea and electrolytes	Serum calcium, magnesium 
Blood glucose 	Hypoglycaemia (can mimic/cause a seizure)
Liver function test	Check metabolic disorder 
Cerebrospinal fluid analysis	Check central nervous system infection 
Serology 	Syphilis, HIV, collagen disease
Erythrocyte sedimentation rate, C-reactive protein	Check inflammatory or infectious disorder 

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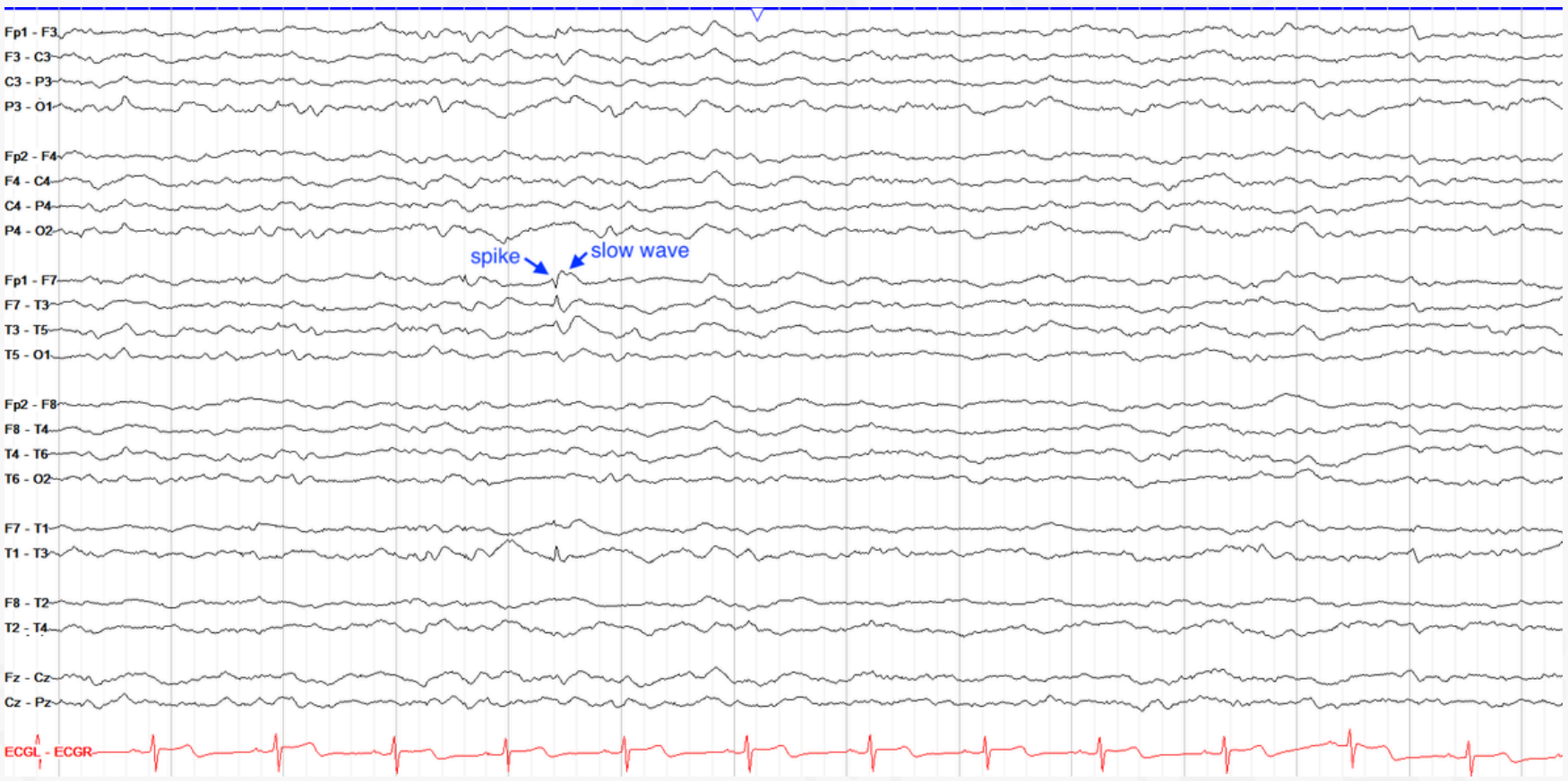
Investigation

Imaging:

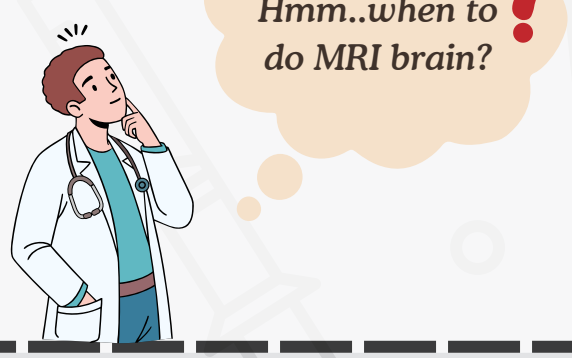
1. Electroencephalography (EEG)

To categorize epilepsy and understand its cause, rather than confirming diagnosis

- EEG abnormalities in epilepsy
  - Focal cortical spikes
  - Generalised spike-and-wave activity
  - Continuous epileptic activity in status epilepticus
- If routine EEG is normal → Sleep recordings or 24- hour ambulatory EEG
- If uncertain cause → Inpatient EEG videotelemetry



2. MRI Brain



Check structural lesions

Indications:

- Age of onset > 16 years old
- Focal features clinically
- Focal seizure shown by EEG
- Difficult control or deteriorating

References

1. Kumar & Clark's Clinical Medicine 10th edition
2. Fisher RS, Acevedo C, Arzimanoglou A, Bogacz A, Cross JH, Elger CE, et al. ILAE official report: a practical clinical definition of epilepsy. Epilepsia 2014;55(4):475-82.
3. https://www.ilae.org/guidelines/definition-and-classification/operational-classification-2017/ilae-2017-classification-of-seizure-types-checklist
4. Isnard J, Hagiwara K, Montavont A, Catenoix H, Mazzola L, Ostrowsky-Coste K, Guenot M, Rheims S. Semiology of insular lobe seizures. Revue neurologique. 2019 Mar 1;175(3):144-9.
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11. Spencer D, Burchiel K. Selective amygdalohippocampectomy. Epilepsy Research and Treatment. 2012;2012(1):382095.

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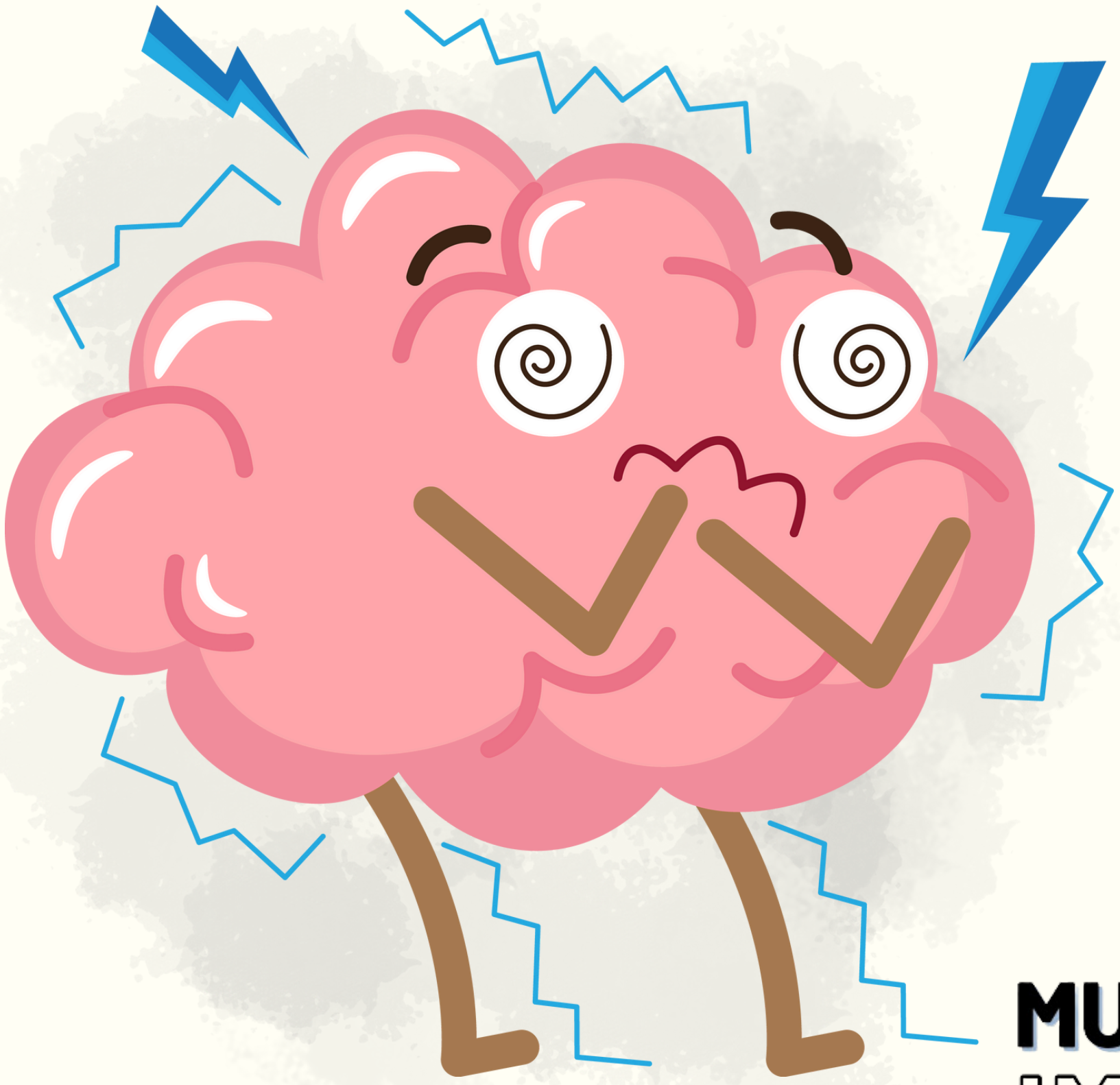
EPILEPSY

[PART 2: EPILESY MANAGEMENT]



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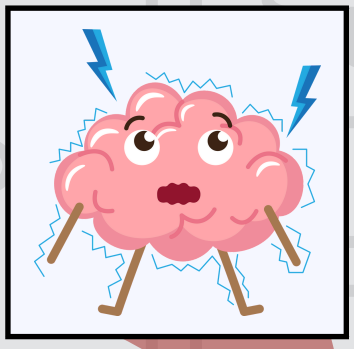
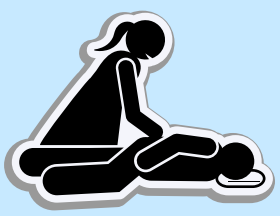
First Aid Management



Summon urgent medical attention if convulsions continue for more than 5 mins or recur without the person regaining consciousness

Supportive care

	**Move the patient away from danger**
	**Turn the person into the ‘recovery’ position (left side semi-prone)**
	**Protect the airway and maintain oxygenation**

DONT’S

Insert anything in the mouth

- **When tongue-biting occurs at seizure onset**

Leave the person alone unless fully recovered

- **As drowsiness and delirium can persist for up to 1 hour**

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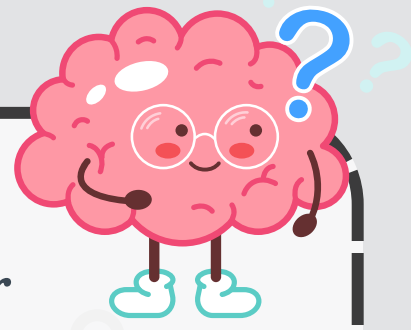
Status Epilepticus



Defined as:

(i) 5 minutes or more of continuous clinical and/or electrographic seizure activity or

(ii) Recurrent seizure activity without recovery (returning to baseline) between seizures

Acute management

Connect monitoring equipment and check the blood glucose concentration

Give intravenous thiamine (for Wernicke's encephalopathy)

- If alcohol withdrawal cannot be excluded

Secure IV access (insert two large-bore IV cannula)

Send blood samples to pathology

(refer to "Part 1 - Investigation")

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Management of Status Epilepticus

Start drug treatment after 5 minutes of continuous seizure activity or repeated seizures without full recovery of consciousness between attacks.

Manage a medical emergency:

Most need intubation

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Give a benzodiazepine:

Midazolam OR Diazepam OR Clonazepam

↓

Give an antiepileptic drug:

Not needed if the seizure stops promptly and the cause has been identified and reversed

Adults:

Levetiracetam OR

Sodium valproate

Phenytoin is **NOT** preferred due to adverse effects:

- Arrhythmia
- Infusion problems
- Hypotension

Children:

Levetiracetam OR

Phenytoin

Phenobarbital is **NOT** preferred due to:

- Risk of respiratory depression

Sodium valproate is **NOT** preferred due to:

- Hepatotoxicity in children younger than 3

↓

Perform an electroencephalogram (EEG)

- *When the visible signs stopped in all patients who have not fully regained consciousness*
- *To exclude nonconvulsive status epilepticus*

→

Transfer to intensive care unit and seek expert advice if the seizure continues

- *Infusion of a general anesthetic if still having seizures after 15 minutes*
  - *Thiopentone*
  - *Propofol*

Pharmacological Treatment

Consider starting treatment after the first seizure for high recurrence risk:

- Focal seizures
- Epileptiform abnormalities on EEG
- Abnormal neurological examination
- Lesion on neuroimaging

Seizure types	First line antiepileptic drug (AED)
Focal	**Carbamazepine**
Generalised	**Sodium valproate** **Teratogenic** • Avoid in female patients planning for pregnancy or ensure contraception **Risk of neurodevelopmental disorders in children born to males taking sodium valproate** • Discuss with male patients of reproductive potential
Absence epilepsy	**Ethosuximide**
Unclear	Adult females of childbearing potential who do not have reliable contraception: **Levetiracetam** All others: **Sodium valproate**

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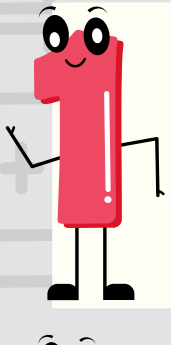
Non-pharmacological Treatment

Refractory Epilepsy:

Seizures that persist despite adequate treatment – especially in temporal lobe epilepsy – may be considered refractory or drug-resistant epilepsy

What to do next?



Re-evaluate the diagnosis:

- *Is it truly epilepsy?*
- *Could it be a mimic (e.g., syncope, PNES)?*

Check treatment adherence:

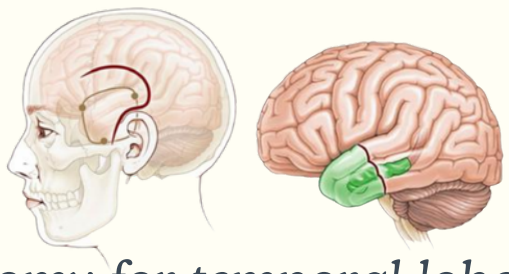
- *Missed doses or underdosing are common cause*

Optimise therapy

- *Use maximum tolerated doses*
- *Consider polytherapy*

Non Pharmacological Treatment Options:

- *Vagal nerve stimulation*
- *Ketogenic low-carbohydrate diet*
- *Epilepsy surgery*
  - *Most common: anterior temporal lobectomy for temporal lobe epilepsy associated with hippocampal sclerosis*



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Adverse effects

Carbamazepine

REMEMBER: CAR SIDE

Central nervous system effects
- Drowsiness
- Dizziness
- Ataxia

Aplastic anemia, **A**granulocytosis

Rash (Stevens-Johnson Syndrome)

SIADH

Induces liver enzymes P450

Diplopia, Vitamin **D** deficiency

Eosinophilia

Monitor serum 25(OH)D (vitamin D) concentration in patients on long-term antiepileptic drug therapy

Testing for the HLA-B*1502 allele in patients of Asian origin (other than Japanese) is advised before starting therapy.

Phenytoin

REMEMBER: DR PHENYTOIN

Vitamin **D** deficiency

Rash (Stevens-Johnson Syndrome)

Pseudolymphoma, P450 induction

Hirsutism

Enlarged gums

Nystagmus

Yellow-brown skin

Teratogenicity

Osteopenia

Inhibited folate absorption

Neuropathy

Sodium valproate

REMEMBER: VALPROaTE

Vomit

Alopecia

Liver damage

Pancreatitis, **P**450 inhibition

Rash

Obesity (weight gain)

Tremor, **T**eratogenicity

Epigastric pain

But…
- Low risk of teratogenicity: ***Levetiracetam***
- No interaction with hormonal contraception: ***Sodium valproate, Levetiracetam***

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Non-pharmacological Treatment

Avoid triggers & risks

- Sleep deprivation
- Strobe lights

- Excess alcohol or drugs
- Swimming and dangerous sports like rock-climbing
- Working at heights

Lifestyle Advice

- Stop driving after a seizure and inform the regulatory authorities if they hold a driving licence
- Leaving bathroom and lavatory doors unlocked
- Taking showers rather than baths

- Keep a seizure diary

- Never stop AEDs abruptly → may cause status epilepticus

CONTINUE

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References

1. Kumar & Clark's Clinical Medicine 10th edition
2. Fisher RS, Acevedo C, Arzimanoglou A, Bogacz A, Cross JH, Elger CE, et al. ILAE official report: a practical clinical definition of epilepsy. Epilepsia 2014;55(4):475-82.
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