EPILEPSY

[DEPTH OF BIOLOGY]

- A central nervous system (neurological) disorder.
- Recurring & unpredictable seizures

SEIZURE is a period when the brain cells or neurons synchronously active (active at the same time) [DEPTH OF BIOLOGY]

Neurons are active, means they are firing or sending messages using electrical signal relayed from neuron to neuron [DEPTH OF BIOLOGY]

Neuron under microscope

[DEPTH OF BIOLOGY]

Each electrical signal that passes through it is just really just ions flowing in & out via protein channels

[DEPTH OF BIOLOGY]

This ion flow is controlled through neurotransmitters (a type of signalling molecule & receptor)

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NEUROTRANSMITTER

Binds to the receptor

Tell the cell to open up ion channel & relay electrical message	Tell the cell to close the ion channel & stop relaying electrical message
Called EXCITATORY NEUROTRANSMITTER	**Called INHIBITORY NEUROTRANSMITTER**

[DEPTH OF BIOLOGY]

- During a seizure clusture of neurons in the brain becomes temporarily impaired & [DEPTH OF BIOLOGY]
- start sending out a ton of excitatory signal over & over
- This sometimes is said to be ***PAROXYSMAL***

[DEPTH OF BIOLOGY]

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- This paroxysmal discharge is thought to happen due to either too much excitation or too less inhibition [DEPTH OF BIOLOGY]
- The main excitatory neurotransmitter in the brain is ***GLUTAMATE*** & ***NMDA*** is the primary receptor that respond to glutamate by opening ion channels that lets ***calcium in***

A +ve ion that tells the cell to send signal

[DEPTH OF BIOLOGY]

- Some patients with epilepsy tend to have fast or long lasting activation of these receptors

- The main inhibitory neurotransmitter is ***GABA*** which binds to GABA receptors that tell the cell to inhibit the signal by opening channel that let in ***chloride ion*** [DEPTH OF BIOLOGY]

A –ve ion that tells the cell to inhibit signal

- Some patients with epilepsy seem to have genetic mutation in which their GABA receptor are dysfunctional & so they are not able to help inhibit signals [DEPTH OF BIOLOGY]

- These receptor and ion channel might be affected by brain tumour, brain injury & infection [DEPTH OF BIOLOGY]
- Decrease in inhibition or increase in activation

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Group of neurons start firing simultaneously over & over noticed by jerking , moving & losing consciousness & also subjective experiences

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All depends upon which type of neuron is affected in brain

Only noticed by person experiencing it like fear or strange smell

[DEPTH OF BIOLOGY]

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INEPILEPSY PATIENT

[DEPTH OF BIOLOGY]

- When the affected area is limited to one hemisphere- or 1 half of the brain or sometimes even a small area like a single lobe we call it focal /partial seizure

SIMPLE PARTIAL SEIZURE	COMPLETE PARTIAL SEIZURE
•Remain conscious •Typically affect small area of brain & can involve the person experiencing- •***Strange sensation like hearing or tasting something*** •But can ***also involve jerking movement in special muscle group***	•Impaired consciousness= ***Complete loss of consciousness or impaired awareness & responsiveness*** •May not remember •Abnormal behaviour •Originate from temporal lobe

Neuron controlling muscles are affected

-if *jerking activity starts in specific muscle group & spread to surrounding muscle group as more neuron are affected*

It is referred as ***JACKSONIAN MARCH***

GENERALISED SEIZURES

[DEPTH OF BIOLOGY]

- Both hemispheres are affected
- Sometimes a seizure will start as a focal seizure & then quickly develop into a generalised seizure [DEPTH OF BIOLOGY]
- In this situation it is called focal bilateral tonic clonic or secondary generalised seizure because a focal seizure came before it & was a primary event

[DEPTH OF BIOLOGY]

GENERALISED SEIZURES

A. TONIC	B. ATONIC
Where muscle become stiff & flexed [DEPTH OF BIOLOGY]	Where the muscle suddenly relax &become floppy, which can cause the patient to fall but as time forwards resulting in further injury

C.CLONIC	where they have violent muscle contractions also known as CONVULSION.

D. TONIC CLONIC SEIZURE- (most common generalised seizure)

Patient experiences a tonic phase where the muscles suddenly tense up followed by the CLONIC PHASE, where muscles rapidly contract & relax .

E.MYOCL -ONIC	Short muscle twitch, sometimes a single twitch but sometimes many in short period of time.

F.ABSECE -NCE SEIZURE	Where patient have some sort of impaired awareness & responsivenss ***OUTWARD SIGN-*** the person looks like they have spaced out

[DEPTH OF BIOLOGY]

If the seizure themselves last for a long period of time (≥ 5 min) *[without returing back to normal in b/w]*

Then it is called ***EPILEPTIASIS***

[DEPTH OF BIOLOGY]

They are generally tonic- clonic sub-type of seizure, but it can also be caused by other reasons

- This is considered as medical emergency and can be life threatning if not treated immediately
- Patient is treated with benzodiazepines
- Helps in enhancing GABA effect (inhibitory neurotransmitter) [DEPTH OF BIOLOGY]

[DEPTH OF BIOLOGY]

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SOMETIMES PATIENT CAN EXPERIENCE-

1. ***CONFUSION:*** post ictal confusion i.e. After seizure
2. ***PARALYSIS:*** affects the arms or legs usually limited to one side of the body [DEPTH OF BIOLOGY]

Temporary & severe suppression of seizure- affected area

DIAGNOSIS

1. BRAIN IMAGNING-

MRI & C.T. Scan : look for abnormalities

2. ELECTRO ENCEPHALOGRAM [E.E.G.]-

Detect electrical signal in the brain

Since Epilepsy can vary from patient to patient in terms of severity & frequency of seizures;

Diagnosis requires tests & examination of clinical history

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TREATMENT

1. ***DAILY MEDICATION-*** anti convulsants

[DEPTH OF BIOLOGY]

Wide range of option available that have different target in brain ; depends upon patients needs including factor like

- age
- Other health problems
- lifestyle

2. ***EPILEPSY SURGERY-*** they remove the specific part of brain/tumor that cause seizure

[DEPTH OF BIOLOGY]

3. Nerve stimulation might also be considered where certain nerves like the vagus nerve are stimulated which is thought to control seizure by influencing neurotransmitter release

[DEPTH OF BIOLOGY]

4. Also patient might adopt **a keto diet** ;

This diet forces the body to **burn fat instead of carbohydrate which produces ketone bodies- which are used by the brain as a source of energy instead of glucose**

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