NEUROPIX

Epilepsy Disease – The Basics

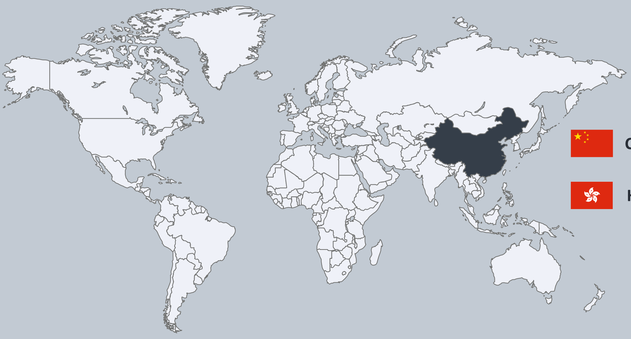
Epilepsy is a neurological disorder characterized by long-term risk of recurrent seziures of an unknown cause. Epileptic seziures show abnormal excessive neuronal activity in the cortex of the brain.

FACTS & FIGURES

- World Health Organisation predicts ~8% mean prevalence of active epilepsy
- Epilepsy patients are prone to severe comorbidities like depression, anxiety and are high-risk of premature death
- Most epileptic seizures are convulsive (~60%), while others are absence seizures (~40%) i.e. brief periods of loss in consciousness

GLOBAL SPOTLIGHT

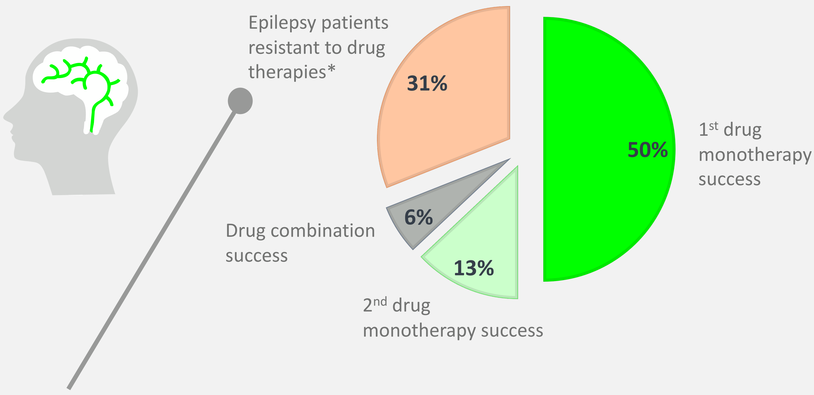
Epilepsy affects >70 million people worldwide[1]



China: >6.5 million patients[2]

Hong Kong: ~70,000 patients

CLINICAL SPOTLIGHT – Treatment Successes[3]



Options for drug-resistant patients

Neurosurgery is often considered for epileptic patients resistant to drug treatments. There is a high chance of reducing seziures with ablative surgery but this is only suitable for <10% of patients, where seizures are known to arise from a specific part of the brain (i.e. focal epilepsies). The brain operation is highly invasive and aims to remove the brain tissue that causes the seizures and also block the nerve tracts along which the seizures spread.

CLINICAL NEUROMODULATION

Neuromodulation is a clinical option for treatment of epilepsy. It utilizes specific electrical parameters to stimulate key nerves via an implanted or external neurostimulation device. This can be achieved in various ways, for example, through invasive neurosurgery, or with biomedically engineered electrodes placed on the surface of the skin at particular anatomical areas of the body.

Invasive

Non-Invasive

DBS

Deep Brain Stimulation (DBS) - electrodes are implanted into brain nuclei and are connected to an neurostimulator placed under the skin of the chest cavity. Electrical stimulation is used to directly modulate key areas to reduce seizures from occuring.

VNS

Invasive vagus nerve stimulation (VNS) - an electrode is placed into the neck (cervical) region directly connecting to the vagus nerve. A neurostimulator is connected to the electrode and placed under the skin of the chest cavity. Electrical stimulation is used to activate the vagus nerve and signals are sent to higher brain centres reducing seizures.

tVNS

Transcutaneous vagus nerve stimulation (tVNS) - a wearable ear electrode is used to stimulate key nerve fibres in the auricle (auricular branch of the vagus nerve) through an external neurostimulator. Electrical stimulation delivered through the skin activates the vagus nerve and these signals activate higher brain centres reducing seizures from occuring.[4]

References

[1] Singh and Trevick. Neurol Clin 2016;34(4):837-847
[2] Trinka et al. Epilepsia 2019; 60 Suppl 1:7-21
[3] Tang et al. Front Neurol 2017;6;8:301
[4] Bauer et al. Brain Stimul 2016;9(3):356-363

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