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Seizures in critically ill pediatric patients

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النوبات العصبية في مرضي الأطفال ذوي الحالات الحرجة

رسالة مقالية مقدمة للحصول علي درجة الماجستير في الرعاية المركزة

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بسم الله الرحمن الرحيم

"قَالُوا سُبْحَانَكَ لا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ"

صدق الله العظيم

(سورة البقرة:٣٢)

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Sobhy Ali Ali Elnafad

Abbreviation

Abbreviation	Meaning
AMPA	a-amino-3-hydroxy-5-methyl-isoxazolopropionic acid
ARS	Acute repetitive seizure
AED	Antiepileptic drug
ARAS	Ascending reticular activating system
BBB	Blood brain barrier
BZD	Benzodiazepines
BOLD	Blood-oxygen-level-dependent
CNS	Central nervous system
CBF	Cerebral blood flow
CBV	Cerebral blood volume
CMRO2	Cerebral metabolic rate for oxygen
CPP	Cerebral perfusion pressure
CSE	Convulsive Status epilepticus
CSF	Cerebrospinal fluid
DNA	Deoxyribonucleic Acid
EEG	Electroencephalography
EPC	Epilepsia partialis continua
ESES	Electrical status epilepticus in slow wave sleep
FDG	Fluoro Deoxy Glucose
fMRI	functional Magnetic Resonance Imaging
GABA	Gama amino butyric acid
GCSE	Generalized convulsive status epilepticus
GLT1	Glutamate transporter 1
HHV- B6	Human herpesvirus 6B

ICP	Intracranial pressure
ILAE	International League Against Epilepsy
IV	Intravenous
IM	Intramuscular
KD	Ketogenic diet
kPa	Kilopascal
MAP	Mean arterial pressure
mGluR	Metabotropic glutamate receptors
NCS	Non-convulsive seizures
NCSE	Non-convulsive status epilepticus
NF1	Neurofibromatosis type
NMDA	N-methyl-D-aspartic acid
PaCO2	Partial pressure of carbon dioxide in arterial blood
PaO2	Partial pressure of oxygen in arterial blood
PDH	Pyruvate dehydrogenase
PET	positron emission tomography
PICU	Pediatric Intensive Care Unit
PNS	Peripheral nervous system
REM sleep	Rapid eye movement sleep
RSE	Refractory status epilepticus
SPECT	Single-photon emission computed tomography
SE	Status epilepticus
TSC1	Tuberous sclerosis complex 1
TSC2	Tuberous sclerosis complex 2

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Introduction

Seizure is a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain while; epilepsy is a disorder of the brain characterized by an enduring predisposition to generate epileptic seizures, and by the neurobiological, cognitive, psychological, and social consequences of this condition. The definition of epilepsy requires the occurrence of at least one epileptic seizure ***(Fisher et al., 2014).***

Seizures occur in critically ill children in various conditions. In all situations, it is crucial to identify potential causes or contributors, particularly reversible factors, such as metabolic disturbances, fever, hypoxia, and medications. For SE, it is imperative to begin treatment as soon as possible and to treat until success is verified with EEG or the patient returns to normal mental status. Nonconvulsive seizures are underdiagnosed. Most seizures in critically ill children are non-convulsive and can be detected only with EEG monitoring ***(Khaled and Hirsch, 2008).***

The potential anti-epileptic drugs (AED) complications have changed the approach to treatment to one in which each child who presents with a first seizure receives a risk-benefit assessment to weigh the benefits of treatment, including lowering seizure recurrence and decreasing long-term consequences of epilepsy, against the adverse effects of AED treatment ***(Chelse et al., 2013).***

Aim of the essay

The aim of the essay is to discuss the critically ill pediatric patients and to define, classify and manage seizures in them.

Introduction

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Seizures occur in critically ill children in various conditions. In all situations, it is crucial to identify potential causes or contributors, particularly reversible factors, such as metabolic disturbances, fever, hypoxia, and medications. For SE, it is imperative to begin treatment as soon as possible and to treat until success is verified with EEG or the patient returns to normal mental status. Nonconvulsive seizures are underdiagnosed. Most seizures in critically ill children are non-convulsive and can be detected only with EEG monitoring ***(Khaled and Hirsch, 2008).***

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Anatomical and Physiological consideration in the brain

The nervous system contains a central nervous system (CNS) and the peripheral nervous system (PNS). CNS consist of the brain and the spinal cord which taking in afferent and sensitive information and providing efferent somatic or visceral responses along with the nerves long cords that form the peripheral nervous system (PNS) that establish the connection between the CNS and the rest of the body ***(Olivetti, 2015).***

Gross Anatomy:

The Brain Stem: brain stem links the spinal cord to the brain. It deals with advanced involuntary human functions as breathing, blood pressure, and heart rate, digestion; controls a lot of reflex motor actions. The brain stem contains the reticular system, which is necessary for consciousness and have a major role in arousal (being wakeful and aware). The brain stem obtains many types of sensory input and 'pre-processes' it then sends it on to higher brain parts. The highest segment of the brain-stem is termed the pons (bridge) **(Figure 1);** then, the first major structure is the medulla oblongata where, some cranial nerves exit and enter the CNS ***(Blumenfeld, 2011)***.