

Contents

Subjects	Page
List of Tables	II
List of Figures	III
List of Abbreviations.....	V
Aim of the Essay	VIII
• Introduction	1
• Chapter (1): Physiology of CNS	3
• Chapter (2): Cerebral Monitoring	28
• Chapter (3): Spinal Cord and Peripheral Nerve Monitoring	77
• Chapter (4): Interpretation of Neurological Monitoring During Anesthesia	98
• Summary	110
• References	114
• Arabic Summary	

No.	Table	Page
<u>1</u>	Cerebral Blood Flow Thresholds.	5
<u>2</u>	Basic Characteristics of EEG wave bands.	49
<u>3</u>	Glasgow Coma Scale (GCS).	55
<u>4</u>	Predictive value of the pupillary light response and the glasgow coma scale following cardiac arrest.	57
<u>5</u>	Summary and uses of multi-modal monitors.	104

List of Figures

No.	Figure	Page
<u>1</u>	Relation between CBF and MAP.	7
<u>2</u>	Relationship between extremes of CPP and intracranial pressure ICP in states of normal (purple line) and reduced intracranial compliance (blue line).	10
<u>3</u>	Spinal cord crosssection.	23
<u>4</u>	Interventricular catheter drain.	31
<u>5</u>	Possible sites of ICP Monitoring: a) intraventricular drain; b) intraparenchymal probe; c) epidural probe; d) Subarachnoid probe.	31
<u>6</u>	Typical system for ICP measurement via an intraventricular drain.	32
<u>7</u>	Laser Doppler Flowmetry.	38
<u>8</u>	Key regions (shaded in colour) in the central nervous system that contribute to the state of consciousness.	45
<u>9</u>	Relative amplitude changes in EEG frequency bands during anesthesia.	48
<u>10</u>	Bispectral Index.	51
<u>11</u>	Microdialysis catheter and principle.	60
<u>12</u>	Different causes in type 2 LPR increase.	62
<u>13</u>	Proposed algorithm in the use of brain oximetry.	66

List of Figures

<u>No.</u>	<u>Figure</u>	<u>Page</u>
<u>14</u>	Saturated venous Oxygen Catheter.	69
<u>15</u>	The technology of cerebral oximetry allows sampling of tissue from 2 photodetectors, each with light sources penetrating to different depths to determine tissue oxygenation.	74
<u>16</u>	Cerox Monitor (Ornim)	75
<u>17</u>	Equanox (Nonin)	75
<u>18</u>	Fore-Sight (CASMED)	76
<u>19</u>	INVOS (Covidien)	76
<u>20</u>	Electrophysiologic tests used to monitor spinal deformity procedures are organized according to the structures they protect and the neural injuries they help to prevent.	78
<u>21</u>	Sensory pathways.	83
<u>22</u>	Monitoring of SSEP.	84
<u>23</u>	Spinal cord tracts.	88
<u>24</u>	Motor pathway.	89
<u>25</u>	Monitoring of MEP.	91

List of Abbreviations

^{133}Xe	Xenon
^{18}FDG	$^{18}\text{Fluoro-Deoxy-Glucose}$
$^{99}\text{Tc-HMPAO}$	Hydroxymethylpropylene amine oxime
ABI	Acute brain injury
AEP	Auditory Evoked Potentials
ATP	Adenosine triphosphate
AVTO2	Arterial and jugular venous oxygen tension
BAEP	Brainstem Auditory Evoked potentials
BBB	Blood-brain barrier
BIS	Bispectral Index
BP	Blood pressure
C	Cervical
CA	Cerebral autoregulation
CBF	Cerebral Blood Flow
CBP	Cardiopulmonary bypass
CBV	Cerebral blood volume
CEA	Carotid endarterectomy
CMAPs	Compound muscle action potential
CMD	Cerebral microdialysis
CMRO2	Cerebral metabolic rate for oxygen
CNS	Central nervous system
CO2	Carbon dioxide
CPP	Cerebral perfusion pressure
CSF	Cerebrospinal fluid
CST	Corticospinal tract
CT	Computed tomography
CVR	Cerebrovascular resistance
DGA	Depth of General Anesthesia

List of Abbreviations

DHCA	Deep hypothermic circulatory arrest
DO2	Oxygen delivery
DOA	Depth of anesthesia
dSEP	Dermatome sensory evoked potentials
ECoG	Electrocorticography
EEG	Electroencephalogram
EMG	Electromyography
EP	Evoked potentials
EVD	External ventricular drain
FAD	Flavin adenine dinucleotide
GA	General anesthesia
GABA	Gamma-Aminobutyric acid
GCS	Glasgow coma scale
HMPAO-SPECT	Hydroxymethylpropylene amine oxime-Single-photon Emission Computed Tomography
ICP	Intracranial pressure
ICU	Intensive care unit
IIT	Intensive insulin therapy
IJV	Internal jugular vein
IOM	Intraoperative monitoring
IV	Intravenous
LDF	Laser-Doppler flowmetry
LPR	Lactate-pyruvate ratio
MAP	Mean arterial pressure
MCA	Middle cerebral artery
MEP	Motor evoked potentials
MRI	Magnetic resonance imaging
MSE	Multiscale entropy
MTT	Mean transit time

List of Abbreviations

NAD	Nicotinamide adenine dinucleotide
NICU	Neurosurgical intensive care unit
NIRS	Cerebral near-infrared spectroscopy
OEF	Oxygen extraction fraction
ONSD	Optic nerve sheath diameter
OR	Operating room
PaCO₂	Partial pressure of carbon dioxide
PaO₂	Arterial oxygen tension
PbO₂	Partial pressure of oxygen
PbtO₂	Brain oxygen tension
PDHC	Pyruvate dehydrogenase complex
PET	Positron emission tomography
PPP	Pentose phosphate pathway
PtiO₂	Patient tissue oxygenation
PTSD	Post-traumatic stress disorder
PVI	Pressure volume index
rCBF	Regional cerebral blood flow
rCBV	Regional cerebral blood volume
rCMRGlu	Regional cerebral glucose metabolic rate
rMTT	Regional mean transit time
rSO₂	Regional hemoglobin oxygen saturation
SAH	Subarachnoid hemorrhage
S_E	Sample entropy
SEP	Sensory evoked potentials
SjvO₂	Jugular venous oxygen saturation
SPECT /CT	Single-photon Emission Computed Tomography
SSEP	Somatosensory evoked potentials
SvO₂	Mixed central venous saturation
TBI	Traumatic brain injury

TCD	Transcranial Doppler
tceMEP	Transcranial electrical motor evoked potential
TcMEP	Transcranial motor evoked potential
Tc-SPECT	Transcranial -Single-photon Emission Computed Tomography
TD	Thermal diffusion
TD-rCBF	Thermal Diffusion Flowmetry of Regional Cerebral Blood Flow
VEP	Visual evoked potentials
VPL	Ventroposterolateral
Xe-CT	Xenon- Computed Tomography



Aim of the Essay

The goals of this essay are to detect the recent advances in the various fields of neurological monitoring during anesthesia including cerebral monitoring of oxygenation, hemodynamics, function and metabolism, spinal cord and peripheral nerve monitoring and to know their clinical interpretation and their availability for clinical use to minimize risks of neurological impairment during various surgeries.



Introduction





Aim of the Essay





Chapter One

Physiology of CNS





Chapter Two

Cerebral Monitoring





Chapter Three

Spinal Cord and Peripheral Nerve Monitoring





Chapter Four

Interpretation of Neurological Monitoring During Anesthesia

