RECENT ADVANCES IN NEUROLOGICAL EMERGENCIES IN PEDIATRIC INTENSIVE CARE UNIT

ESSAY

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الله

بسم الله الرحمن الرحيم

قالوا سبحانك لا علم لنا إلا ما
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LIST OF ABBREVIATIONS

CBF	Cereberal blood flow
ICP	Intracranial pressure
CBV	Cereberal blood volume
CSF	Cerebro spinal fluid
ATPase	Adinosine triphosphatase
K	Potassium
Na	Sodium
Ca	Calcium
Mg	Magnisium
PCO_2	Carbon dioxide
PO_2	Oxygen
BBB	Blood-brain barrier
ADP	Adenosine diphosphate
P.I.C.U	Pediatric intensive care unit
CNS	Central nervous system
GABA	Gamma aminobutyrie acid
HSV	Herpes simplex virus
HSE	Herpes simplex encephalitis.
RNA	Ribonuclic acid.
ECF	Extracellular fluid
GBS	Guillain barre syndrome
CMV	Cytomegalo virus
EBV	Ebstain barr virus.
CT	Computed tomography
EEG	Electroencephalogram
LP	Lumbar puncture
MRI	Magnetic resorance imaging
BAEP	Brain stem evoked potentials
MLF	Medical longitudinal fasciculus

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INTRODUCTION

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INTRODUCTION

The introduction of intensive care services into hospital practice represents a notable advance in the critically - ill infants and children. Under appropriate circumstances, a significant reduction of morbidity and mortality can be achieved by proper and balanced application of knowledge, skill and technology.

Neurological emergencies represent the greatest challenge faced by paediatritions. Prompt diagnosis and proper treatment are life saving and need intensive care and special management (Eishenwald, 1979).

The most common paediatric neurologic dysfunctions include central neurological emergencies e.g. head trauma, cerebral hypoxia, infections, cerebral haemorrhages, drug poisoning, status epilepticus: all of which necessitate comprehensive intensive care, as well as some peripheral neurological conditions e.g. polyneuritis, myasthenia gravis, and tetanus are considered neurological emergencies which need intensive care.
Also coma of various causes is life threatining situation (Downes, 1975; and Pascoe, 1984).

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AIM OF ESSAY

The aim of this eassy is to study the pattern of neurological emergencies in paediatric intensive care unit with special reference to mean of diagnosis and early detection of its complications as soon as possible to start prompt treatment with resultant better prognosis .

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REVIEW OF LITERATURE

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INTRACRANIAL HAEMODYNAMICS

Intracranial haemodynamics are perhaps the corner stone of modern neurointensive care, and many pediatric intensive care disease entities force the pediatric intensiviste to grapple with problems of cerebral blood flow (CBF), cerebral perfusion pressure and intracranial hypertension. However, intracranial pressure is one determinant of CBF and provides only a rough gauge of the true haemodynamics of the brain. Future progress of neurointensive care rests not only with intracranial pressure (ICP) measurement but also with clinical measurement of (CBF), and assessment of cerebral metabolism *(Regor, 1987)*.

1. *Traditional view :*

The traditional approach of the intracranial vault is that it is a variety of the compartment syndrome (primary injury to tissue leads to limits blood flow because of tension produced within the compartment) approaches to the management of increased intracranial pressure involve attempts to decrease any one of the components of that space e.g. the brain itself (oedema-reducing therapy), cerebral blood volume (CBV) or hyperventilation of CSF (CSF removal). This approach has been used for the past decade with reasonable success, but unfortunately it is not completely satisfactory (Micheael et al., 1987).

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2. ***Controversies about the traditional view:***

The response of ICP to an expanding mass depends on absolute volume and its rate of rise. A slowly growing tumour may produces no symptoms for years whereas a haemorrhage of the same size may be fatal *(Thomas and Herold, 1986).*

An important difference in these situations is the time course of changes of intracranial contents. Once this principle is established, it should become apparent that there are many curves related to the pressure volume dynamics of intracranial vault. rather than single curve as in traditional view *(Rogers and Fraystman, 1985).*

In summary, many concepts that underlie modern neurologic intensive care are simplified and do not adequately explain the physiology, successes or failure of many clinical management practices.

Neurointensive care is an area of complex physiology which is not susceptible to simple analysis. Instead, a thorough understanding of the anatomy of the intracranial space, the regulation of CBF and the implications of intracranial pressure are needed for the clinician to intelligently ask the "right type of questions" and to advance further this field in the decade to come *(Dean et al., 1987).*

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3. *Anatomy of the intracranial vault:*

There are several important aspects to the anatomy of the intracranial vault. Specifically, the brain is restricted by the skull, and there are only a few entities that can occupy the skull. In addition, however, it must be remembered that the skull is not completely closed and contains compartments within it, thus it is possible for movement and herniation to occur within the skull *(Roger, 1987).*

Bony limitation :

The skull is a rigid bony structure consisting of multiple bones connected by sutures.

At the base of skull, the foramen magnum encircles the spinal cord which extends into the vertebral column. Thus, the intracranial vault really extends into, and includes, the vertebral space. This has important implications. The initial addition of a small intracranial pressure, partly C.S.F. is translocated into the vertebral space, in which there is some compliance. *(Dean et al., 1987).*

The skull has rigid dural folds which support the brain. Tentorium cerebelli is the most important septum dividing cranium into the anterior and posterior (divide into supratentorial and infratentorial in relation to the brain). In the center of the tentorium, there is an opening through which the midbrain passes. In front of the midbrain lies basilar artery

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(supplies blood to midbrain and pons) and the oculomotor nerve *(Rgoer et al., 1983)*.

On top of the tentorium lies the temporal lobes with their most medial portions, the unci, bulging anteriorly into the tentorial notch in close proximity to the oculomotor nerve. Displacement of brain through or against the tentorium causes injury to the brain, converting reversible central nervous system dysfunction into irreversible damage. In addition, compression of the cerebral aqueduct or the subarachnoid space around the brain-stem may cause, displacement of cerebral ventricular fluid and resulting in further increase of intracranial pressure. As the brain is displaced, further damage occurs as it is compressed against another dural septum. The midline falx, which separates the cortex into halves, shift laterlaly across the intracranial cavity causes compression of the medial hemispheres of the brain resulting in vascular compromise, ischemia, swelling of the tissue and further build-up in intracranial pressure. Herniation of brain stem and parts of the cerebellum downward through the foramen magnum can also cause brain stem destruction, blockage of the flow of subarachnoid cerebral fluid *(Fleisher et al., 1983)*.

Although the cranial cavity of a young child is somewhat more elastic than that of adult (due to open sutures and anatomically open fontanelles) it can acutely tolerate only a limited increase of intracranial

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pressure. If the increase is not compensated brain will be compressed against the rigid dural folds which support it *(Roger et al., 1983).*

4. ***Components of the intracranial space:***

The composition of the intracranial contents includes brain substance itself, blood and C.S.F. Thus, the situation may be defined as:

$V_{intracranial} = B_{Brain} + V_{Blood} + V_{CSF} + V_{Others}$

where

V = the volume made of each constituent, the overall intracranial volume cannot change because the contents are effectively incompressible. The most important concept here is that changes in any one volume requires changes in the other volumes so that the total volume of the system will not change. Thus the presence of a brain tumour requires a reduction in the volumes of brain, blood or CSF, or all three, unless the bony limitations of the skull are circumvented by surgical means, *(Roger and Traystman, 1985).*

a) **Brain:**

Most brain weight is derived from water, which makes up 80% of the wet weight of gray matter and 68% of the wet weight of white matter *(Miller, 1979).*

Volume of brain substance can be altered by the presence of oedema fluid or tumour. With brain oedema, brain water is increased usually

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