Role of Anti Coagulants in Head Trauma

An Essay

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بسم الله الرحمن الرحيم

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List of Abbreviations

Abb.	Mean
ACA	Anterior cerebral artery
ACoA	Anterior communicating artery
ADAMTS-13	A disintegrin and metal loprotease with thrombospondin type 1 repeats
ATC	Acute traumatic coagulopathy
$AVDO_2$	Arteriovenous Difference Of Oxygen
$AVDO_2$	Arteriovenous Difference Of Oxygen
BBB	Blood Brain Barrier
CBF	Cerebral Blood Flow
CBF	Cerebral Blood Flow
CMR	Cerebral Metabolic Rate
$CMRO_2$	Cerebral Metabolic Rate of Oxygen
CNS	Central Nervous System
CO	Cardiac output
CO_2	Carbon Dioxide
CPP	Cerebral Perfusion Pressure
CPP	Cerebral Perfusion Pressure
CRASH	Clinical Randomization of an Antifibrinolytic in Significant Hemorrhage'
CT	Computed Tomography
CVP	Central Venous Pressure
CVR	Cerebral vascular resistance
CVR	Cerebrovascular resistance
DNA	Deoxyribonucleic acid
DVT	Deep vein thrombosis
EEG	Electroencephalography

Abb.	Mean
ELISA	Enzyme-linked immunosorbent assay
GCS	Glasgow Coma Scale
H_2O_2	Hydrogen peroxide
HAT	Heparin-associated thrombocytopenia
ICA	Internal carotid artery
ICP	Intracranial pressure
IgG/M	Immunoglobin G/M
IJV	Internal jugular vein
IL	Interleukin
JVP	Jugular venous pressure
LMWHs	Low-molecular-weight heparins
MAP	Mean arterial pressure
MCA	Middle cerebral artery
MPE	Massive pulmonary embolism
NMDA	N-Methyl-D-Aspartate
O_2	Superoxide anion
OH	Hydroxyl free radical
PAF	Platelet activating factor
PaO_2	Arterial Oxygen Tension
PC	Phosphotidylcoline
PCA	Posterior cerebral artery
PCoA	Posterior communicating artery
PE	Phosphatidylethanol-amine
PE	Pulmonary embolism
PS	Phosphatidyl serine
PSGL-1	P-selectin glycoprotein ligand 1
PTT	Partial Thromboplastin Time
PVC	Pulmonary vascular capacitance

Abb.	Mean
RAP	Right atrial pressure
RVEDP	Right ventricular end-diastolic pressure
RVM	Rostral ventrolateral medulla
RVPP	Right ventricular coronary perfusion pressure
SCA	Superior cerebellar artery
sICAM	Soluble intercellular adhesion molecules
TBI	Traumatic Brain Injury
UFH	Unfractionated heparin
VIP	Vasoactive intestinal peptide
VIP	Vasoactive Intestinal Peptide
VR	Venous return
VTE	Venous thromboembolism
VTE	Venous thrombo-embolism
VWF	Von Willebrand factor

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INTRODUCTION

Traumatic brain injury (TBI)is worldwide leading cause of death and disability in the young and the fifth cause of death in old patient beyond 65 years old; Deep venous thrombosis is the significant factor of increased morbidity and mortality ***(Kim et al., 2012).***

Trauma causes an acute disruption of the equilibrium between all components of haemostasis (coagulation, anticoagulation, fibrinolysis, platelets and endothelium). In patients with a combination of severe tissue damage and systemic hypoperfusion, this will progress rapidly to an endogenous coagulopathy that is independently associated with worse outcomes. New discoveries of the interactions between neurohormonal, vascular, and coagulation systems are beginning to explain how this haemostatic impairment develops and offer novel targets for therapeutic manipulation. Routine coagulation screening tests are ineffective for diagnosing ATC and guiding resuscitation in optimum time. Viscoelastic coagulation tests have emerged as practical, rapid and sensitive diagnostic modalities. Their role in therapeutic targeting requires further validation ***(Frith et al., 2012).***

There is clear evidence of increased risk of thromboembolism and pulmonary embolism so, pharmacological prophylaxis for prevention of venous thromboembolism should be initiated as early as possible ***(Cohen et al., 2006).***

AIM OF THE WORK

The aim of the work is to clarify the role of anticoagulants in treatment of head trauma (brain injury) its timing and indication.

ANATOMY OF THE BRAIN

The central nervous system (CNS) can be divided into brain and spinal cord. The brain, is contained within the cranium, and constitutes the upper, greatly expanded part of the central nervous system. The average weight of the brain, in the adult male, is about 1380 gm; that of the female, about 1250 gm.

The Cerebral Hemispheres

The cerebral hemispheres constitute the largest part of the brain. The hemispheres are separated medially by the longitudinal cerebral fissure. They are connected across the middle line by the corpus callosum. Each possesses a central cavity (the lateral ventricle) and presents three surfaces: lateral, medial, and inferior. These three surfaces are separated from each other by the borders: supero-medial, infero-lateral, medial occipital and medial orbital.

The surfaces of the hemispheres are moulded into a number of irregular eminences, named gyri or convolutions, and separated by furrows termed fissures or sulci. By means of these fissures and sulci, assisted by certain arbitrary lines, each hemisphere is divided into the following lobes: the frontal, the

parietal, the temporal, and the occipital ***(Mendoza and Foundas, 2008)***.

The anterior end of the hemisphere is named the frontal pole; the posterior end, the occipital pole; and the anterior end of the temporal lobe, the temporal pole.

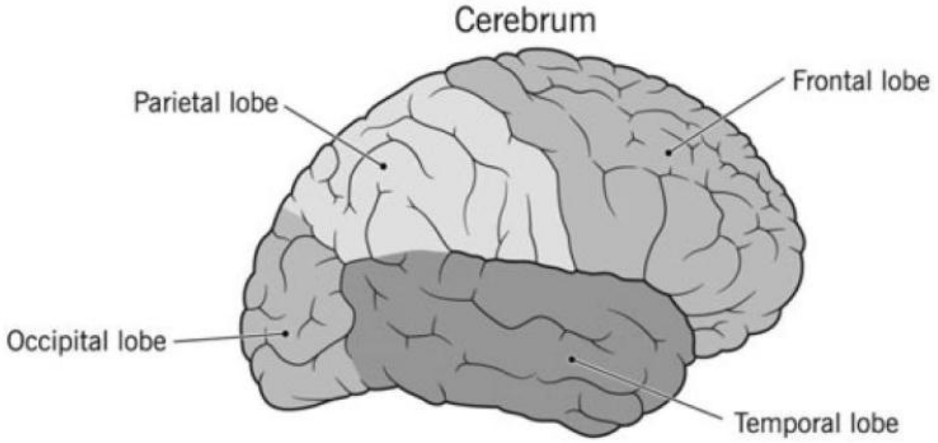

Figure (1): Principal fissures and lobes of the cerebrum viewed laterally ***(Fine, 2008)***.

Structure of the Cerebral Hemispheres:

The cerebral hemispheres are composed of gray and white substance.

The white substance consists of medullated fibers, varying in size, and arranged in bundles separated by neuroglia.

They may be divided, according to their course and connections, into three distinct systems:

1. Projection fibers connect the hemisphere with the lower parts of the brain and with the spinal cord.

2. Transverse or commissural fibers unite the two hemispheres.

3. Association fibers connect different structures in the same hemisphere.

The gray substance of the hemisphere forms the cerebral cortex, the caudate nucleus, the lentiform nucleus, the claustrum, and the nucleus amygdalae. The cortex is made up of nerve cells of varying size and shape, and of nerve fibers which are either medullated or naked axis-cylinders, imbedded in a matrix of neuroglia ***(Mendoza and Foundas, 2008)***.

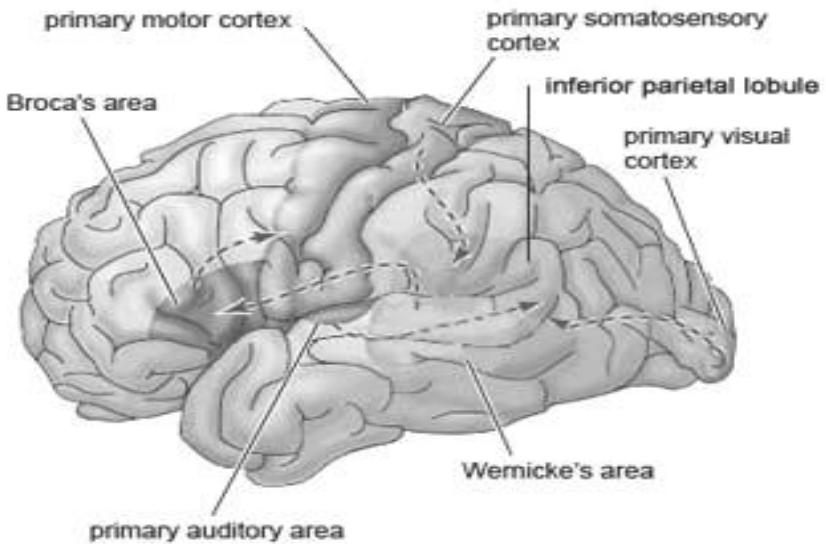

Figure (2): Functional areas of the human brain ***(Fine, 2008).***

Cerebral Localization:

a- Motor Areas

The motor area occupies the anterior central and frontal gyri and the paracentral lobule. The centers for the lower limb are located on the uppermost part of the anterior central gyrus and its continuation on to the paracentral lobule. Those for the trunk are on the upper portion, and those for the upper limb on the middle portion of the anterior central gyrus. The facial centers are situated on the lower part of the anterior central gyrus.