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List of Abbreviations

ACEIs: Angiotensin Converting Enzyme Inhibitors.
AFE: Amniotic fluid embolism.
AHA: American Heart Association.
AP: Arterial Pressure.
AQP channel: Aquaporin channel.
AT1R: Angiotensin 1 receptor.
AVM: Arteriovenous Malformations.
BBB: Blood Brain Barrier.
C T: Computed Tomography.
CBF: Cerebral Blood Flow.
CNS: Central Nervous System.
CO: Cardiac Output.
CPP: Cerebral Perfusion Pressure.
CSF: Cerebrospinal Fluid.
CVR: Cerebrovascular resistance.
CVT: Cerebral Venous Thrombosis.
ECG: Electrocardiography.

FMD: Fibromuscular dysplasia.
GCS: Glasgow Coma Scale.
HELLP: Hemolysis, Elevated Liver Enzymes, low platelet count.
HIT: Heparin Induced Thrombocytopenia.
HTN: Hypertension.
ICA: Internal Carotid Artery.
ICH: Intracranial hemorrhage.
ICP: Intra cranial pressure.
IEL: Internal Elastic Lamina.
LMWHs: Low Molecular Weight Heparins.
MAP: Mean Arterial Pressure.
MRI: Magnetic Resonance Imaging.
MS: Multiple Sclerosis.
PA: Pial Arteries.
PAI-1, PAI-2: Plasminogen activator inhibitor 1 and 2.
PCA: Posterior Cerebral Artery.
PPAR$^{\gamma}$: peroxisome proliferator activated receptor.
RPLE: Reversible Posterior Leukoencephalopathy.

r-tPA: Recombinant tissue plasminogen activator.
SAH: Subarachnoid hemorrhage
SAP: Systolic Arterial Pressure.
SBP: Systolic Blood Pressure.
SLE: Systemic Lupus Erythematosis.
SSS: Superior Sagittal Sinus.
TAFI: Thrombin activatable fibrinolysis inhibitor.
TCD: Transcranial Doppler.
TEE: Transesophageal Echocardiography.
TIA: Transient Ischemic Attacks.
TNFa: Tumour Necrosis Factor alpha.
TTE: Transthoracic Echocardiography.
UFH: Unfractionated Heparin.
VEGF: Vascular Endothelial Growth Factor.

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CEREBROVASCULAR DISORDERS COMPLICATING PREGNANCY

Essay

Submitted for the Partial Fulfillment of Master Degree

In Intensive Care

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الاضطرابات الدماغية الوعائية خلال فترة الحمل

رسالة

توطئة للحصول على درجة الماجستير فى الرعايه المركزه

مقدمة من

الطبيب/ احمد نبيل احمد السكنيدى

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Introduction

Cerebrovascular stroke is the third leading cause of death and the primary cause of adult disability. It is an important source of maternal and fetal morbidity and is associated with more than 12% of maternal deaths. It may be broadly classified as ischemic or haemorrhagic ***(Bushnell and chireau, 2011)***.

The incidence of stroke during the childbearing ages alone is 10 cases per 100,000 women. Some authors have questioned whether the risk of stroke increases in association with pregnancy itself. However, evidence suggests that the postpartum period is associated with an increased risk of ischemic stroke ***(Bushnell and chireau, 2011)***.

Causes of ischemic stroke in pregnancy may be divided into two general categories: Pregnancy-specific etiologies and stroke-in-the-young factors. The first category includes Preeclampsia and eclampsia that are present in 24-47% of ischemic strokes, Choriocarcinoma, Amniotic fluid embolism, Peripartum cardiomyopathy and postpartum cerebral angiopathy. These rare and reversible causes can cause narrowing of the blood vessels, which can lead to ischemia ***(Carmel et al., 2012)***.

Causes of stroke in a young person includes atherothrombotic etiologies, cardioembolic events, lacunar

disease, and other vasculopathy (e.g., fibromuscular dysplasia [FMD]), dissection, arteritis, hematologic disorders, drugs (e.g., cocaine), migraine or unknown causes ***(Bushnell and chireau, 2011)***.

Women at risk for intracerebral hemorrhage in pregnancy are those with eclampsia which represent 14-44% of intracranial hemorrhages, vasculitis, aneurysm or vascular malformation. Hypertension is the most important risk factor for intracranial hemorrhage in pregnancy ***(Facchinetti et al., 2009)***.

Obtaining a complete history, performing physical examination, asking for imaging studies and laboratory studies are important aspects of evaluating the type of the cerebrovascular event that may have occurred. The patient should undergo a complete physical examination, including funduscopic, cardiovascular, skin, and full neurologic examinations ***(Carmel et aL., 2012).***

The differential diagnosis of stroke in young women includes seizure, brain tumor, reversible posterior leukoencephalopathy (RPLE), multiple sclerosis (MS), and migraine. Women with known cerebrovascular disease who are pregnant or plan to become pregnant may take steps to maximize the safety of their pregnancy. If they have previously

experienced a cerebral infarction, its cause should have been or should be determined ***(Carmel et al., 2012).***

Treatment of stroke may minimize neuronal damage and is aimed at preventing recurrences. The stroke etiology also must be considered when determining the best treatment ***(Carmel et al., 2012).***

Aim of the Work

Discussing etiology and differential diagnosis of ischemic and hemorrhagic cerebrovascular strokes during pregnancy and to highlight recent methods for prevention and treatment of cerebrovascular disorders during pregnancy.

Cerebral Circulation and Neurological Changes During Pregnancy

Anatomy of Cerebral Circulation:

The arteries:

The brain is one of the most highly perfused organs in the body. It is therefore not surprising that the arterial blood supply to the human brain consists of two pairs of large arteries, the right and left internal carotid and the right and left vertebral arteries. The internal carotid arteries principally supply the cerebrum, whereas the two vertebral arteries join distally to form the basilar artery ***(Cohen et al., 1996).***

Branches of the vertebral and basilar arteries supply blood for the cerebellum and brain stem. Proximally, the basilar artery joins the two internal carotid arteries and other communicating arteries to form a complete anastomotic ring at the base of the brain known as the circle of Willis (figure1) which gives rise to three pairs of main arteries, the anterior, middle and posterior cerebral arteries, which divide into progressively smaller arteries and arterioles that run along the surface until they penetrate the brain tissue to supply blood to the corresponding regions of the cerebral cortex ***(Cohen et al., 1996).***