Assessment of Cerebrovascular Resistance Index in Chronic Liver disease Patients with and without Hepatic Encephalopathy using Transcranial Doppler Ultrasonography

Thesis

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بِسْمِ اللّهِ الرّحمَنِ الرّحيمِ

[...رَبِّ أَوزِعنِي أَن أَشكُرَ نِعمَتَكَ
الّتِي أَنْعَمْتَ عَلَيَّ وعَلى والِدَيَّ
وأَنْ أَعْمَلَ صَالِحاً تَرْضَاهُ
وأَدْخِلْنِي بِرَحْمَتِكَ فِي
عِبَادِكَ الصَّالِحِينَ]

صدق الله العظيم

النمل.. اية رقم ١٩

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Contents

List of Abbreviations *(Cont.)*

ACA	: Anterior Cerebral Artery
AIH	: Autoimmune Hepatitis
ALD	: Alcoholic Liver Disease
ALT	: Alanin Transferase
ANA	: Anti Nuclear Antibodies
ASMA	: Anti Smooth Muscle Antibodies
AST	: Aspartate Transaminase
AASLD	:American Association for the study of liver Diseases
CBC	: Complete Blood Count
CBF	: Cerebral blood flow
CHC	: Chronic Hepatitis C
HBV	: Hepatitis B virus
HCV	: Hepatitis C Virus
HE	: Hepatic Encephalopathy
HH	: Hereditary Hemochromatosis
HRS	: Hepatorenal Syndrome
HSC	: Hepatic Stellate Cells
ICH	: Intracranial hemorrhage
IDU	: Intravenous Drug Users
INR	: International Normalized Ratio
LKM1	: Anti Liver Kidney Microsomal Antibodies
MCA	: Middle Cerebral Artery
MHE	: Minimal hepatic encephalopathy

List of Abbreviations *(Cont.)*

NAFLD	: Non Alcoholic Fatty Liver Disease
OLT	: Orthotopic Liver Transplantation
PCA	: Posterior cerebral artery
PI	: Pulsatility Index
PSC	: Primary Sclerosing Cholangitis
RI	: Resistance Index
SBP	: Spontaneous Bacterial Peritonitis
SD	: Standard Deviation
TCCD	: Transcranial Color Coded Duplex Sonography
TCD	: Transcranial Doppler Ultrasonography
TIPS	: Trans Jugular Interahepatic Portosystemic Shunt
WD	: Wilson's Disease
WHC	: West Haven Classification

List of Tables

List of Tables *(Cont.)*

List of Tables *(Cont.)*

List of Tables *(Cont.)*

List of Figures

List of Figures *(Cont.)*

Introduction

Liver cirrhosis and chronic liver disease were the 10th leading cause of death for men and the 12th for women in the United States in 2001, killing about 27,000 people each year. Worldwide, an estimated 130–170 million people have HCV infection. HCV prevalence is highest in Egypt at >10% of the general population ***(Hajarizadeh et al., 2013)***.

In Egypt liver cirrhosis and chronic liver disease is a major problem. the commonest underlying cause is HCV infection, the highest prevalence rate of HCV infection in the world have been reported among Egyptian blood donor and seroprevelance rates of 30-40% in villagers ***(Gueera et al., 2012).***

Hepatic encephalopathy is a brain dysfunction caused by liver insufficiency and/or portosystemic shunting. It manifest as a wide spectrum of neuropsychiatric abnormalities ranging from subclinical alterations to coma, after exclusion of other known brain disease ***(Vilstrup et al., 2014).***

The development of hepatic encephalopathy negatively impacts patient survival. The occurrence of encephalopathy severe enough to lead to hospitalization is associated with a survival probability of 42% at 1 year of follow-up and 23% at 3 years as reported in ***(Khungar and Poordad, 2012)*** study.

So in our study, were tried to explore pathophysiological etiologies in developing hepatic encephalopathy and find a different explanation other than the old theories like hyperammonimea, GABA theory; which is cerebral vascular impairment in developing hepatic encephalopathy and put in mind its correction in treatment plan.

So the current study finding cut-off value for cerebrovascular resistive indices may help in screening chronic liver disease patients and prediction of possibility for developing encephalopathy.

Cerebral auto-regulation has been reported to be preserved in patients with liver cirrhosis. But in patients with hepatic encephalopathy cerebral autoregulation is impaired ***(Strauss et al., 2000).***

Transcranial Doppler (TCD) is the only non invasive real-time neuro-imaging modality for the evaluation of characteristics of blood flow in basal intracerebral vessels. TCD has been rapidly evolving from a simple non invasive diagnostic tool to an imaging modality with broad spectrum of clinical applications ***(Tsivgoulis et al., 2009).***

Resistance index (RI), which is a measure of pulsatile blood flow that reflects the resistance to blood flow caused by micro vascular bed distal to the site of measurement.

Pulsatility index (PI), which assesses arteriolar vascular integrity ***(Ulises et al., 2014).***

The mean cerebral blood velocity is not a reliable parameter to detect the alteration of cerebral blood flow. It was found that the cerebral vascular resistance increased with the severity of liver cirrhosis ***(Sugano et al., 2001)***.

The cerebral pulsatility and resistive indices changed in parallel with the severity of hepatic encephalopathy. Doppler parameters significantly increased when hepatic encephalopathy worsened. Increased cerebral vascular resistance might reflect reversible functional changes rather than irreversible anatomical damage. In patients with acute or chronic liver failure cerebral perfusion, determined by TCD, was increased and levels of ammonia and bilirubin were reduced following treatment with the molecular adsorbents recirculating system (an extracorporeal liver support device).Hepatic encephalopathy and cerebral blood flow, determined by transcranial Doppler, improved by liver dialysis treatment ***(Huang et al., 2003).***