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FLUID AND ELECTROLYTE BALANCE IN HEPATIC PATIENTS UNDERGOING LIVER TRANSPLANTATION

An Essay

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By

Mai Mohammed Fouad Mohammed

M.B.B.Ch

Under Supervision of

Prof .Dr. / Farouk Ahmed Sadek

Professor of Anesthesiology and Intensive Care

Faculty of Medicine – Ain Shams University

Dr./ Ahmed Aly Fawaz

Assistant Professor of Anesthesiology and Intensive Care

Faculty of Medicine – Ain Shams University

Dr./ Mohamed Ibrahim Sayed Elahl

Lecturer of Anesthesiology and Intensive Care

Faculty of Medicine – Ain Shams University

Ain Shams University

Faculty of Medicine

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توازن السوائل و الأملاح لمرضى الكبد الخاضعين لعملية زراعة الكبد

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تحت إشراف

الأستاذ الدكتور / فاروق أحمد صادق

أستاذ التخدير والرعاية المركزة

كلية الطب-جامعة عين شمس

الدكتور / أحمد على فواز

أستاذ مساعد التخدير والرعاية المركزة

كلية الطب-جامعة عين شمس

الدكتور / محمد إبراهيم سيد الأهل

مدرس التخدير والرعاية المركزة

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جامعة عين شمس - كلية الطب


بسم الله الرحمن الرحيم
وَأَنْزَلَ اللهُ
عَلَيْكَ الْكِتَابَ
والْحِكْمَةَ
وَعَلَّمَكَ مَا لَمْ
تَكُنْ تَعْلَمُ
وَكَانَ فَضْلُ
اللهِ عَلَيْكَ
عَظِيمًا
صدق الله العظيم
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LIST OF CONTENTS

Title Page No.

LIST OF TABLES

LIST OF TABLES (Cont…)

Table No.	Title	Page No.

LIST OF FIGURES

LIST OF ABBREVIATIONS

Abbrev.	Full term
AIH	*Autoimmune hepatitis*
ALT	*Alanine aminotransferase*
aPTT	*Activated partial thromboplastin type*
ASA	*American society of anesthesiologists*
AST	*Serum aspartate aminotransferase*
BUN	*Blood urea nitrogen*
cAMP	*Cyclic adenosine monophosphate*
CLD	*Chronic liver disease*
CT	*Computed tomography*
CTP	*Child-turcotte-pugh score*
CVP	*Central venous pressure*
DM2	*Diabetes mellitus type 2*
DVT	*Deep venous thrombosis*
ECC	*Extrahepatic cholangiocarcinoma*
EHE	*Hemangioendotheliomas*
ESLD	*End stage liver disease*
FFP	*Fresh frozen plasma*
FHF	*Fulminant hepatic failure*
FLC	*Fibrolamellar carcinoma*
GABA	*γ-aminobuteric acid*
HCC	*Hepatocellular carcinoma*
HDLs	*High density lipoproteins*
HE	*Hepatic encephalopathy*
HES	*Hydroxyethyl starch*
ICC	*Intrahepatic cholangiocarcinoma*
INR	*International normalized ratio*
IR	*Insulin resistance*
LDLs	*Low density lipoproteins*

LIST OF ABBREVIATIONS (Cont…)

Abbrev.	Full term
LT	*Liver transplantation*
MELD	*Model for end stage liver disease*
MRI	*Magnetic resonance imaging*
NS	*Normal saline*
PEEP	*Positive end expiratory pressure*
PELD	*Pediatric end stage liver disease*
PNFG	*Primary non functioning graft*
PRS	*Post reperfusion syndrome*
PT	*Prothrombin time*
SBP	*Spontaneous bacterial peritonitis*
TEE	*Transesophgeal echocardiography*
TEG	*Thromboelastogram*
TIPSS	*transjugular intrahepatic portosystemic stent shunting*
T-PA	*Tissuse-type plasminogen activator*
TRALI	*Transfusion related lung injury*
UNOS	*United network for organ sharing*
US	*Ultrasound*
VLDLs	*Very low density lipoproteins*

INTRODUCTION

Liver transplantation has emerged as an increasingly successful treatment for patients with end-stage liver disease (ESLD). The operative procedure is extensive, complex, and technically challenging with multiple vascular transections and anastomoses. In addition, the liver is an extremely vascular organ and extensive bleeding can occur ***(Maurer and Spence, 2004).***

The patient selected for transplant should suffer from irreversible, progressive disease for which there is no acceptable, alternative therapy. Recipients are broadly defined as having an intolerable quality of life because of liver disease or having an anticipated length of life of less than 1 year because of liver failure ***(Sherlock & Dooley, 2002).***

Studies have observed that increased blood requirements are associated with a higher incidence of sepsis, a prolonged stay in the intensive care unit, a higher rate of severe cytomegalovirus infection, and higher rates of graft failure and patient mortality ***(Sanchez et al., 1998).***

The anesthesiologist's and the surgeon's experience and attitude seem to be more important than the correction of any biochemical variables during the liver transplant in

addition to adjuvant therapies like drugs and use of the cell-saver device which is a safe and effective method of salvaging red blood cells during liver transplantation ***(Massicotte et al., 2004)*.**

Sodium, chloride, and lactic acid load may be responsible for acidosis during surgery, so avoiding large quantities of sodium chloride-containing fluids may help to decrease the incidence of hyperchloremic acidosis among these patients ***(Brandstrup et al., 2003).***

Liver transplant recipients are discharged from the operating room to the intensive care unit. In the ICU the patient is monitored with frequent laboratory work and hemodynamic assessment. Vital signs, fluid intake and output, drain output, bile production, and signs of postoperative bleeding are recorded hourly ***(Hudson & Gentile, 2006).***

AIM OF THE WORK

The study aims to review the fluid and electrolyte balance of hepatic patients undergoing liver transplantation.

ANATOMY OF THE LIVER

The liver is the largest organ in the body it weighs 1200–1500 gram and comprises one-fiftieth of the total adult body weight. The liver has two surfaces a diaphragmatic surface in the anterior and superior directions and a visceral surface in the postero-inferior direction **(*Sherlock & Dooley, 2002*).**

Relations of the liver

The liver fills the right hypochondrium and epigastric region, extending into the left hypochondrium, just below the diaphragm. It is related by its domed upper surface to the diaphragm, which separates it from pleura, lungs, pericardium and heart. Its postero-inferior (visceral) surface is related to the abdominal oesophagus, the stomach, duodenum, hepatic flexure of the colon and the right kidney and suprarenal, and the gall-bladder (Fig. 1 & 2) ***(Ellis, 2006).***

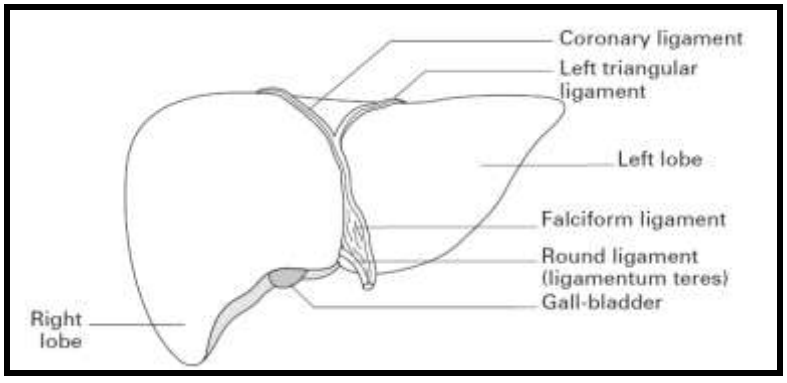

Figure (1): Anterior of the liver ***(Ellis, 2006)***

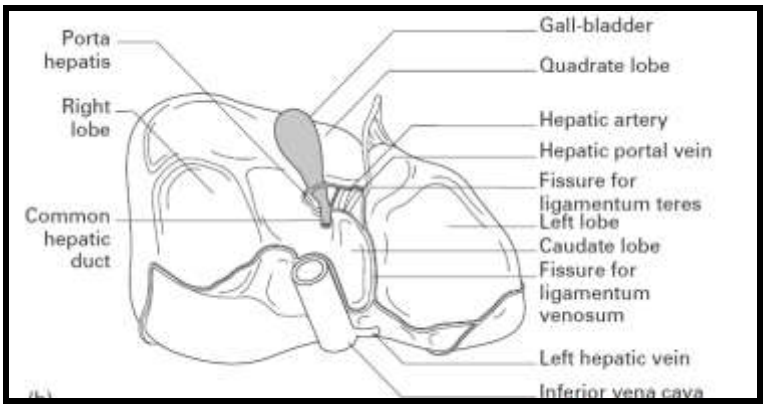

Figure (2): Visceral surface the liver ***(Ellis, 2006)***

Anatomical divisions of the liver

The liver is divided into a large right and a small left anatomical lobe by the attachment of the falciform ligament. The quadrate and caudate lobes arise from the right lobe of liver, but functionally are distinct where the quadrate lobe is visible on the upper part of the visceral surface of the liver, but functionally it is related to the left lobe of the liver, while The caudate lobe is visible on the lower part of the visceral surface of the liver, but functionally it is separate from the right and the left lobes of the liver ***(Blumgart & Hann, 2000).***

Blood supply

The liver has a double blood supply:

(1) Portal venous supply: the portal vein is formed from the convergence of the superior mesenteric and splenic