ICU Care of Acute Post-Operative Complications of Liver Transplantation

Essay for Partial Fulfillment of
'Master Degree Essay' in Intensive Care

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ADH	**A**lcohol **D**ehydrogenase.
AHT	**A**rterial **H**ypertension.
AIDS	**A**cquired **I**mmunodeficiency **S**yndrome.
AKI	**A**cute **K**idney **I**njury.
AKIN	**A**cute **K**idney **I**njury **N**etwork.
APCs	**A**ntigen **P**resenting **C**ells.
ARDS	**A**dult **R**espiratory **D**istress **S**yndrome.
AST	**A**spartate **T**ransaminase.
ATP	**A**denosine **T**riphosphate
BBB	**B**lood **B**rain **B**arrier.
BMI	**B**ody **M**ass **I**ndex.
CBD	**C**ommon **B**ile **D**uct.
CCP	**C**erebral **P**erfusion **P**ressure.
CMV	**C**ytomegalo-**v**irus.
CNIs	**C**alcineurin **I**nhibitors.
CNS	**C**entral **N**ervous **S**ystem.
CPAP	**C**ontinuous **P**ositive **A**irway **P**ressure.
CRRT	**C**ontinuous **R**enal **R**eplacement **T**herapy.
CT	**C**omputed **T**omography.
CTP	**C**ild-**T**urcotte-**P**ugh.
DDLT	**D**eceased **D**onor **L**iver **T**ransplantation.
DKA	**D**iabetic **K**eto-**A**cidosis.
DM	**D**iabetes **M**ellitus.
ECM	**E**xtra-**C**ellular **M**atrix.
ERCP	**E**ndoscopic **R**etrograde **C**holangiopanctreatography.
ET-1	**E**ndothelin-1.
FCH	**F**ibrosing **C**holestaticHepatitis.
FHF	**F**ulminant **H**epatic **F**ailure.
GFR	**Glomerular filtration rate.**
GM-CSF	**G**ranulocyte-**m**acrophage **c**olony-**s**timulating **f**actor
GW/RW	**G**raft **W**eight to the **R**ecipient's **W**eight ratio
HAT	**H**epatic **A**rtery **T**hrombosis.
HBe Ag	**H**epatitis **B** **E**nvelope **A**ntigen.
HBIG	**H**epatitis **B** Immuno-globulin.

HBV	**H**epatitis **B** **V**irus**.**
HCC	**H**epato-**C**ellular **C**arcinoma.
HCV	**H**epatitis **C** **V**irus**.**
HE	**H**epatic **E**ncephalopathy.
HIV	**H**uman **I**mmunodeficiency **V**irus.
HMG-CoA	**H**ydroxymethylglutaryl-CoA
HRS	**H**epato-**r**enal **S**yndrome**.**
HSV	**H**erpes **S**implex **V**irus.
HSCs	**H**epatic **S**tellate **C**ells.
ICP	**I**ntra-**c**ranial **P**ressure**.**
ICU	**I**ntensive **C**are **U**nit**.**
IGF-1	**I**nsulin **l**ike **G**rowth **F**actor.
IL	**I**nterleukin**-1.**
INR	**I**nternational **N**ormalized **R**atio.
IVC	**I**nferior **V**ena **C**ava**.**
IV	**Intra-venously.**
KGL	**P**otassium **G**luconate.
LDL	**L**ow-**d**ensity **L**ipoprotein.
LDLT	**L**iving **D**onor **L**iver **T**ransplantation**.**
Log	**L**ogarithm**.**
LSECs	**L**iver **S**inusoidal **E**ndothelial **C**ells**.**
LT	**L**iver **T**ransplantation**.**
MA	**M**etabolic **a**lkalosis**.**
MELD	**M**odel for **E**nd Stage **L**iver **D**isease.
MEOS	**M**icrosomal **E**thanol-**O**xidizing **S**ystem.
MHCI	**M**ajor **H**isto-comptibility **C**omplex **I**.
MMF	**M**ycophenolate **M**ofetil
MRI	**Magnetic Resonance Imaging.**
MRSA	Methicillin-resistant Staphylococcus Aureus**.**
NAS	**N**on-**A**nastomotic **S**tricture**.**
NIPPV	**Non-invasive positive pressure Ventilation.**
NK	**N**atural **K**iller **c**ells**.**
NKT	**N**atural **K**iller **T** **c**ells**.**
NO	**Nitric Oxide**.
NPC	**Non-Parenchymal Cells**.
OLT	**O**rthotopic **L**iver **T**ransplantation.

PAI-1	**P**lasminogen **A**ctivator **I**nhibitor.
PBC	**P**rimary **b**iliary **C**irrhosis.
PCR	**P**olymerase **C**hain **R**eaction.
Peg-INF	**P**egylated **I**nterferone.
PELD	**P**ediatric **E**nd-**S**tage **L**iver **D**isease.
PPC	**P**ost-**o**perative **P**ulmonary **C**omplications.
PSC	**P**rimary **S**clerosing **C**holangitis.
PVT	**P**ortal **V**ein **T**hrombosis.
RBCs	**R**ed **B**lood **C**ells.
RIFLE	**R**isk, **I**njury, **F**ailure, **L**oss, **E**nd-stage kidney disease.
SBp	**S**pontaneous **B**acterial **P**eritonitis.
SBT	**S**pontaneous **B**reathing **T**rials.
SFSS	**S**mall **F**or **S**ize **S**yndrome.
SIRS	**S**ystemic **I**nflammatory **R**esponse **S**yndrome.
SVR	**S**ustained **V**irologic **R**esponse.
TAFI	**T**hrombin **A**ctivatable **F**ibrinolysis **I**nhibitor.
TPA	**T**issue **P**lasminogen **A**ctivator.
TNF-alpha	**T**umor **N**ecrosis **F**actor **A**lpha.
UCSF	**U**niversity of **C**alifornia, **S**an **F**rancisco.
UKELD	**U**nited **K**ingdom **m**odel for **E**nd-Stage **L**iver **D**isease.
UNOS	**U**nited **N**etwork for **O**rgan **S**haring.
VLDL	**V**ery **L**ow **D**ensity **L**ipoprotein

Introduction

Introduction

Liver transplantation is the treatment of choice for patients with decompensated cirrhosis, acute liver failure, small hepatocellular carcinomas (HCCs), and chronic end-stage liver disease of different causes ***(Lucey et al., 2013).***

The improvement in anesthesia and surgical skills, organ support device adoption, understanding of transplant immunology, and better intensive care management of complications resulted in increased survival rate of liver transplanted patients ***(Feltraco, et al., 2011).*** However, liver transplantation remains a complex operation which is associated with significant morbidity and mortality ***(Moreno and Berenguer, 2006).***

During and in the immediate postoperative period, the liver is subjected to multiple potentially damaging factors which affect the operative outcome. These factors include hypotension, hypoxia, ischemia and hepato-toxic drugs as well as donor-related factors (steatosis of the liver, the use of vasoactive drugs, hemodynamic changes), surgical-related aspects (intra-operative or post-operative hemorrhage, vascular or biliary complications). Therefore, the postoperative outcome of each patient depends mainly on patient's preoperative state, the quality of the donated organ, and the complexity of the surgery ***(Murray and Carithers, 2006).***

Improvements in pre-transplant treatment of cirrhosis-related organ dysfunction, intraoperative patient management, and improvements in the treatment of rejection and infections helped for better outcome of the patients. However, many important factors including unexpected peri-operative complications still make immediate post-operative care challenging and the early outcome unpredictable ***(Feltraco, et al., 2011).***

Early post-operative management is crucial as significant changes may occur in both the graft and distant organs so, immediately after the operation, patients are transferred to the surgical intensive care unit (ICU) where they are maintained on mechanical ventilation till becoming fully conscious and able to breathe on their own and able to protect their airway. During the ICU stay, there is a need for close attention to management of fluid and electrolytes, which may be significantly altered as a result of prolonged operation and massive fluid shifts. Also, immunosuppressive agents are started early post-operative based on specific protocols and on the patient's renal function with their doses adjusted according to blood levels and functional status of the transplanted liver and renal function ***(Eghtesad et al., 2005).***

Immediate achievement of physiological status including omission of mechanical ventilation, omission of invasive monitoring, and prevention of any type of complication is the major goal. Immediate enteral nutrition with immunonutrition and probiotics restores mucosal barrier function and decreases infections and other complications after liver transplantation in a natural manner ***(Mueller et al., 2004).***

If the graft function proves satisfactory and there are no early surgical complications, such patients can be rapidly weaned from sedation and ventilation, extubated, and discharged to the general ward within 48 hours ***(Vukcevic and Marik, 2007).***

Also in the early post-operative period, the pattern of liver function test results are monitored and any major alteration in liver function should initiate a series of studies for early detection of signs of dysfunction and according to the results, the adequate treatment is initiated as early as possible ***(Eghtesad et al., 2005).***

The main complications in the immediate postoperative period are related to the graft function (graft dysfunction and rejection), the surgical technique, systemic problems (pulmonary, renal, or neurological complications) as well as infections (bacterial, fungal, and viral).

In the long term, the complications typically result from prolonged immunosuppressive therapy, and include diabetes mellitus, systemic arterial hypertension, de novo neoplasia, and organ toxicities, particularly nephrotoxicity ***(Moreno and Berenguer, 2006).***

Reaching the correct diagnosis is essential for all complications as different therapies often have implications on the graft function and patient outcome. However, the differential diagnosis is difficult due to the similarities of clinical manifestations and laboratory abnormalities of most liver transplant complications. Therefore, the role of post-liver transplantation critical care management is to prevent serious complications, reverse life-threatening complications and offers longer survival ***(Vukcevic and Marik, 2007).***