

**Evaluation of Pre-Operative Nutritional Status
as a Prognostic Value of Outcome in Patients
Subjected to Living Donor Liver
Transplantation**

Thesis

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Contents

	<i>Page No.</i>
List of abbreviations	<i>i</i>
List of Tables	<i>iii</i>
List of Figures	<i>v</i>
Introduction.....	0
Aim of the Work.....	4
Review of Literature	
Living Donor Liver Tyransplant.....	5
Methods for Nutritional Status Evaluation.....	21
Malnutrition	44
Impact of Nutritional Status on Postoperative LDLT	65
Patients and Methods	73
Results	77
Discussion.....	102
Conclusion	116
Summary	117
References.....	123
Arabic Summary	—

List of Abbreviations

AASLD	: American Association for the Study of Liver Diseases
AH	: Acute hepatitis
AMC	: Arm muscle circumference
ASPEN	: American Society for Parenteral and Enteral Nutrition
BIA	: Bioelectrical impedance analysis
BMI	: Body mass index
CAH	: Chronic active hepatitis
CHI	: Creatine-height index
CMV	: Cytomegalovirus
CT	: Computed tomography
CTP	: Child-Turcotte-Pugh
DCH	: Delayed cutaneous hypersensitivity
DDLT	: Deceased donor liver transplantation
DEXA	: Dual-energy x-ray absorptiometry
EBV	: Epstein Barr virus
ESLD	: End-stage liver disease
FFM	: Fat-free mass
FGD	: Fist-grip dynamometry
FM	: Free mass
HBV	: Hepatitis B virus
HCC	: Hepatocellular carcinoma
HCV	: Hepatitis C virus
HIV	: Human immunodeficiency virus
IBW	: Ideal body weight
ICU	: Intensive care unit
Kg	: Kilograms

LDLT	: Living-donor liver transplantation
LT	: Liver transplantation
MAC	: Midarm muscle circumference
MAMC	: Mid-arm muscle circumference
MELD	: Model for End-Stage Liver Disease
MHD	: Maintenance hemodialysis patients
MNA	: Mini-Nutritional Assessment
MST	: Malnutrition Screening Tool
MUST	: Malnutrition Universal Screening Tool
N	: Nitrogen
OLT	: Orthotopic liver transplantation
PAB	: Prealbumin
PBC	: Primary biliary cirrhosis
PCM	: Protein-calorie malnutrition
PCV	: Packed red cells
PEM	: Protein-energy malnutrition
PINI	: Prognostic Inflammatory and Nutritional Index
PN	: Parenteral nutrition
PNI	: Prognostic Nutrition Index
RBP	: Retinol-binding protein
SC	: Sclerosing cholangitis
SGA	: Subjective global assessment
TPN	: Total parenteral nutrition
TSF	: Triceps skin fold
TTR	: Transthyretin
UUN	: Urinary urea nitrogen

List of Tables

Table No.	Title	Page No.
Table (1):	Transplantation Evaluation Process:.....	6
Table (2):	Child-Turcotte-Pugh (CTP) Scoring System to Assess	8
Table (3):	Protocol for Evaluation of Potential:	9
Table (4):	Criteria of living donors	10
Table (5):	Medical Complications in the Immediate Post-Transplantation Period	18
Table (6):	Classification of Nutritional Status by Body Mass Index in Adults	23
Table (7):	Hepatically Synthesized Proteins Used for Assessment of Nutritional Status	31
Table (8):	Subjective Global Assessment (SGA) of Nutritional Status	37
Table (9):	Mini Nutritional Assessment (MNA):	39
Table (10):	Methods for Nutritional Status Evaluation	41
Table (11):	Definitions of malnutrition:	45
Table (12):	Three validated tools for nutrition screening and their rating systems	47
Table (13):	Etiology of Malnutrition in ESLD	53
Table (14):	Goals of Nutritional Therapy in Patients with ESLD Waiting for LT:	60
Table (15):	Prognostic Indices in Hospitalized Patients	71
Table (16):	Demographic characteristics of the two groups.....	78
Table (17):	Risk factors in the two studied groups	80
Table (18):	Child score in the two studied groups	81

Table (19):	Anthropometric measures of the two studied groups.....	83
Table (20):	Subjective global assessments in the two studied groups	84
Table (21):	Mean values of hematological and biochemical parameters of the two studied groups	86
Table (22):	Mean values of prealbumin and transferrin in the two studied groups	88
Table (23):	Mean values of prealbumin and transferrin in the two studied groups	89
Table (24):	Multinomial logistic regression used for prediction of mortality in the studied group.....	90
Table (25):	Complications in the two studied groups.....	91
Table (26):	Mortality in the two studied groups	93
Table (27):	Mid arm circumference (MAC) correlation with ICU stay	94
Table (28):	Mid arm circumference (MAC) correlation with days of mechanical ventilation.....	94
Table (29):	Triceps skin fold (TSF) correlation with ICU stay:	95
Table (30):	Triceps skin fold (TSF) correlation with days of mechanical ventilation	96
Table (31):	Prealbumin levels correlation with ICU stay:	97
Table (32):	Prealbumin and albumin levels correlation with mechanical ventilatory days:.....	97
Table (33):	Transferrin levels correlation with ICU stay.....	98
Table (34):	Transferrin levels correlation with mechanical ventilatory days:.....	99

List of Figures

Figure No.	Title	Page No.
Figure (1):	Hepatic vasculature and bile ducts	12
Figure (2):	Segmental anatomy of the liver as originally described by Couinaud	13
Figure (3):	Risk factors in the two studied groups.	80
Figure (4):	Child score in the two studied groups.	81
Figure (5):	Anthropometric measures of the two studied groups.	83
Figure (6):	Subjective global assessments in the two studied groups.....	84
Figure (7):	Mean value of prealbumin in the two studied groups.....	88
Figure (8):	Mean value of transferrin in the two studied groups.	88
Figure (9):	Mean value of prealbumin in the two studied groups	89
Figure (10):	Mean value of transferrin in the two studied groups	89
Figure (11):	Complications in the two studied groups.	92
Figure (12):	Mortality in the two studied groups.....	93
Figure (13):	Mid arm circumference (MAC) correlation with days of mechanical ventilation	95
Figure (14):	Triceps skin fold (TSF) correlation with days of mechanical ventilation	96

Figure (15): Prealbumin levels correlation with mechanical ventilatory days	98
Figure (16): Transferrin levels correlation with mechanical ventilatory days	99
Figure (17): Cut-off point of serum prealbumin for prediction of mortality	100
Figure (18): Cut-off point of serum transferrin for prediction of mortality	101

Introduction

Liver transplantation is potentially applicable to any acute or chronic condition resulting in irreversible liver dysfunction, provided that the recipient does not have other conditions that will preclude a successful transplant. Metastatic cancer outside liver, active drug or alcohol abuse and active septic infections are absolute contraindications. While infection with HIV was once considered an absolute contraindication, this has been changing recently. Advanced age and serious heart, pulmonary or other disease may also prevent transplantation (relative contraindications). Most liver transplants are performed for chronic liver diseases that lead to irreversible scarring or cirrhosis of the liver. Another cause is cryptogenic liver disease (*Adam et al., 2003*).

Living donor liver transplantation has emerged in recent decades as a critical surgical option for patients with end stage liver disease, such as cirrhosis and/or hepatocellular carcinoma often attributable to one or more of the following: long-term alcohol abuse, long-term untreated Hepatitis C infection, long-term untreated Hepatitis B infection. The concept of living donor liver transplant is based on the remarkable regenerative capacities of the human liver and the widespread shortage of cadaveric livers for patients awaiting transplant. In living donor liver transplant, a piece of healthy liver is surgically removed from a living person and transplanted into a recipient,

immediately after the recipient's diseased liver has been entirely removed (*Tuttle-Newhall et al., 2005*).

Nutrition assessment and therapy in end-stage liver disease has become increasingly important with the advent of living donor liver transplantation. Reduced lean body mass, increased risk of sepsis, and altered metabolism of carbohydrates, protein, and fat are characteristic of patients with liver dysfunction (*Akerman et al., 1993*).

Appropriate nutritional assessment and identification of specific nutrition requirements, whether maintenance, repletion, or the need for weight reduction prior to transplantation, require individualized assessment and, in some cases, aggressive nutrition intervention. The goals are to reduce postoperative complications after transplantation (*Rebecca et al., 2008*).

Nutritional therapy is essential in patients with end stage liver diseases and during all phases of liver transplantation. Adequate nutritional assessment before a transplant helps identify individual problems and may prevent complications. A multidisciplinary team involving the patient's primary care physician, hepatologist, intensivist, registered dietitian, and nursepractitioner should be involved in management and education of patients under liver transplantation evaluation. In the acute posttransplant phase, early nutritional support can reduce complications. Long-term management should be aimed at preventive measures for the metabolic complications of liver transplantation. Provision of adequate nutritional support before

and after liver transplantation will lead to improved outcomes (*Tran et al., 2004*).

Patients with end-stage liver disease often reveal significant protein-energy malnutrition, which may deteriorate after listing for transplantation. Since malnutrition affects post-transplant survival, precise assessment must be an integral part of pre- and post-surgical management. While there is wide agreement that aggressive treatment of nutritional deficiencies is required, strong scientific evidence supporting nutritional therapy is sparse. In practice, oral nutritional supplements are preferred over parenteral nutrition, but enteral tube feeding may be necessary to maintain adequate calorie intake. Protein restriction should be avoided and administration of branched-chain amino acids may help yield a sufficient protein supply. Specific problems such as micronutrient deficiency, fluid balance, cholestasis, encephalopathy, and comorbid conditions need attention in order to optimize patient outcome (*Felix Stickel et al., 2008*).

Aim of the Work

The purpose of this study was to examine preoperative nutritional status as a prognostic parameter of outcome in patients subjected to living donor liver transplantation.

Living Donor Liver Transplant

A living-donor liver transplantation, or transplant, is when a live person donates a part of his or her healthy liver. The donated part then grows to full size in the person who receives it (the recipient). After the transplant, the donor's liver also grows back to full size over a very short period of time, usually days or weeks. Sometimes, however, it can take up to several months. The donor may be a family member, such as a parent, sister, brother, or adult child. The donor can also be a husband or wife. Living-donor transplantation was first done in the 1980s in children as a way to shorten the long wait times for a liver (*Robert et al., 2007*).

Living donor liver transplantation (LDLT) is undoubtedly the single most important development in liver transplantation in the past 10 years. Apart from the growing need, a better understanding of the intrahepatic liver anatomy and liver regeneration, more precise and safe liver-splitting techniques, and refinements in recipient technique and postoperative management have propelled the emergence and wide acceptance of LDLT (*Lo et al., 1997*).

Live-donor liver transplantation:

The details of the formal liver transplantation evaluation vary from center to center, but the essentials are to establish that liver transplantation is indicated in the management of the potential recipient's liver disease, the patient has no

comorbidities severe enough to preclude transplantation, and the patient has adequate emotional and social resources to undergo a major surgical procedure and continue on long-term immunosuppression afterward; table (1).

Table (1): Transplantation Evaluation Process:

Financial screening	Secure approval for evaluation
Medical evaluation	
Hepatology evaluation	Confirm diagnosis and optimize management
Laboratory testing	Assess hepatic synthetic function, serum electrolytes, renal function, viral serologies, markers of other causes of liver disease, tumor markers, ABO-Rh blood typing; 24-hour urine for creatinine clearance; urinalysis and urine drug screen.
Cardiac evaluation:	Electrocardiography and two-dimensional echocardiography, stress testing and cardiology consult if risk factors are present and/or patient is age 40 years or older
Hepatic imaging:	Ultrasonography with Doppler to document portal vein patency, triple-phase computed tomography or gadolinium magnetic resonance imaging for tumor screening.
General health assessment:	Chest film, prostate specific antigen level (men), Pap smear and mammogram (women), colonoscopy if patient is age 50 years or older or has primary sclerosing cholangitis.
Transplantation surgery evaluation:	Assess technical issues and discuss risks of procedure.
Anesthesia evaluation:	Required if unusually high operative risk, e.g., patient has portopulmonary hypertension, hypertrophic obstructive cardiomyopathy, previous anesthesia complications.
Psychiatry or psychology consultation:	If history of substance abuse, psychiatric illness, or adjustment difficulties.
Social work evaluation:	Address potential psychosocial issues and possible effect of transplantation on patient's personal and social system.
Financial and insurance counseling	itemize costs of transplantation and post-transplantation care; help develop financial management plans
Nutritional evaluation:	Assess nutritional status and patient education

(O'Leary et al., 2008)