## FEASIBILITY OF LEFT LOBE GRAFT IN ADULT LIVING DONOR LIVER TRANSPLANTATION

A thesis submitted for partial fulfillment of MD degree in GENERAL SURGERY

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# دراسة جدوي استخداء النب الايسر في نقل الكرد من المتررع الدي بين البالغين

رسالة

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#### **Abbreviations**

| Abbreviation | Meaning  |
|--------------|--|
| 3D-CT        | Three Dimensional CT                               |
| ABO          | Blood Type   |
| AIH          | Autoimmune Hepatitis                               |
| APOLT        | Auxiliary partial orthotopic liver transplantation |
| BMI          | Body Mass Index                                    |
| CT           | Computerized tomography                            |
| CUSA         | Cavitron ultrasonic surgical aspirator             |
| DDLT         | Deceased donor liver transplantation               |
| ERCP         | Endoscopic retrograde cholangiopan-creatography    |
| FAP          | Familial Amyloid Polyneuropathy                    |
| FHF          | Fulminant Hepatic Failure                          |
| GGT          | Gamma Glutemyl Transpeptidase                      |
| GV           | Graft Volume                                       |
| НАТ          | Hepatic Artery Thrombosis                          |
| НВО          | Hyper Baric Oxygen                                 |
| HBV          | Hepatitis B Virus                                  |

| НСС   | Hepatocellular Carcinoma                     |
|-------|--|
| HCV   | Hepatitis C Virus                            |
| HPCS  | Hemi-Porto-Caval-Shumt                       |
| IMC   | International Medical Center, Cairo          |
| INR   | International Normalized Ratio               |
| IVC   | Inferior Vena Cava                           |
| LDLT  | Living Donor Liver Transplantation           |
| LHV   | Left Hepatic Vein                            |
| LL    | Left Lobe                                    |
| LLD   | Living Liver Donation                        |
| LLG   | Left lobe Graft                              |
| LLI   | Left Lobe + Caudate lobe                     |
| MDCT  | Multi-Detector CT                            |
| MELD  | Model of End-Stage Liver Disease             |
| MEVIS | MEdical VISualisation                        |
| MHV   | Middle Hepatic Vein                          |
| MMF   | Mycophenolate Mofetil                        |
| MRCP  | Magnetic resonance cholangio-pancreatography |
| PBC   | Primary Biliary Cirrhosis                    |
| PSC   | Primay Sclerosing Cholangitis                |
| PVP   | Portal Vein Pressure                         |
| RHV   | Right Hepatic Vein                           |
| RL    | Right Lobe                                   |
| RLG   | Right Lobe Graft                             |
| RLV   | Remnant Liver Volume                         |
| SAE   | Splenic artery Embolization                  |
| SLV   | Standard Liver Volume                        |
| SFSG  | Small For Size Graft                         |
| SFSS  | Small For Size Syndrome                      |
| SLVR  | Spleen Liver Volume Ratio                    |

### INTRODUCTION AND AIM OF THE WORK

#### INTRODUCTION

Living donor liver transplantation (LDLT) was first initiated in children in 1989 in response to a severe organ shortage from pediatric donors (Raia et al., 1989).

The indications for living donor liver transplantation (LDLT) have been successfully expanded from pediatric to adult cases especially in countries like Japan and other Asian countries where the availability of brain-dead donors is severely restricted. It has evolved to be an accepted and established alternative to deceased-donor liver transplantation (DDLT) in Western countries and is expected to minimize the mortality of patients awaiting transplantation (Fujita et al., 2000).

At the start of adult LDLT, left lobe (LL)-LDLT was the only option available because of the potential risk for the donor in right lobe (RL)-LDLT. However, the use of LL grafts for adults was severely limited due to their size limitation. Generally, a LL graft can provide only 30–50% of the required liver volume for an adult recipient, and has been thought to be too small for adult recipients to sustain their metabolic demand (Emond et al., 1996).

During this process, the graft type has shifted from the left side of the liver to the right side of the liver to overcome the problems encountered with "small-for-size grafts," that is, a <1.0% graft-to-recipient body weight ratio (GRWR). The use of "small-for-size grafts" leads to "small-for size syndrome," including poor bile production, delayed synthetic

function, prolonged cholestasis and intractable ascites, with subsequent septic complications and higher mortality (Kiuchi et al., 1999).

Graft size plays a role in determining outcomes after liver transplants, but it is not the only factor. The likelihood of small-for size syndrome is influenced not only by the size of the graft but also likely by other factors such as the degree of portal hypertension, MELD score, and spleen size. Perhaps a better term than small-for-size to describe this syndrome is small-for-need (Mark et al., 2009).

The crucial prerequisite to performing LDLT is a minimal morbidity and mortality risk to the healthy living donor. Unfortunately, sporadic donor deaths associated with RL donations have been reported in the United States (Miller et al., 2004) and Europe (Broering et al., 2004), as well as in Japan (Akabayashi et al., 2004). It is reported that operative mortality for the RL donor is estimated to be as high as 0.5–1% (Brown et al., 2003).

To minimize the risk to the donor, LL-LDLT could be an ideal option in adult-to-adult LDLT.

#### **AIM OF THE WORK**

The objective of this study is to retrospectively assess the feasibility of LLG as an option in the Adult Living Donor Liver Transplantation. The study aims to consider the anatomical advantages of the Left Lobe Graft, the safer Donor's hepatectmy and to propose criteria for Left Lobe Graft selection.

# REVIEW OF LITERATURE I-SURGICAL ANATOMY OF THE LIVER

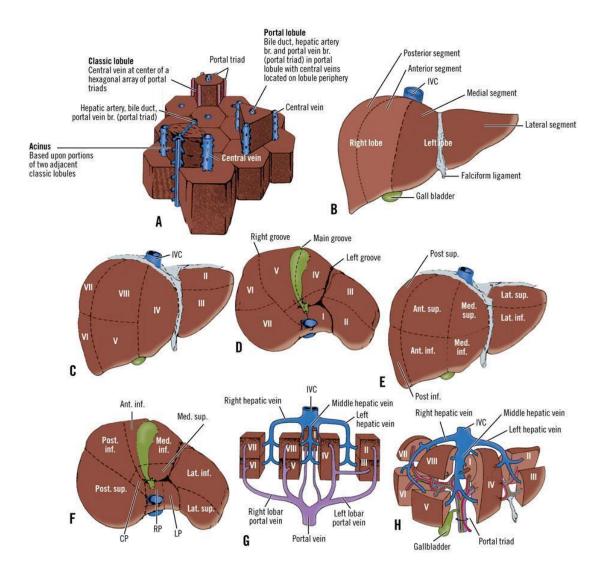
#### SURGICAL ANATOMY OF THE LIVER

The integration of hepatobiliary surgery and liver transplantation, coupled with advances in critical care of the patient afflicted with liver disease, has expanded the role of major hepatic resection (Fortner &Blumgart 2001) and permitted the routine application of partial-liver allografts derived from living or deceased donors to adults and children(Yersiz et al., 2003). In less than a decade, partial-liver allo-grafts have become the most common allograft for pediatric patients, (Marcos et al., 2000) whereas the application of partial-liver allografts to adults from living or deceased donors has dominated recent surgical interest in the transplantation community (Renz et al., 2004). Fundamental to the successful outcome of major hepatic resection or partial-liver transplantation is the avoidance of technical complications. Recognition of this tenet has stimulated intense interest in the intrahepatic architecture of the liver so as to perform procedures that maximize viable hepatic mass and minimize blood loss while averting a biliary or vascular complication (Strasberg 1997).

#### Lobes and Segments of the Liver

#### **Bases of Hepatic Segmentation**

On first inspection, the liver appears to be divided into a large right portion and a much smaller left portion. The apparent plane of division (left fissure) passes through the falciform ligament, the round ligament, and the ligamentum venosum. Unfortunately, this apparent division does not correspond to the internal distribution of bile ducts and blood vessels (Fig. 1.1).



**Figure 1.1: A.** Three concepts of the liver lobule. The "classic" lobule, with central veins and peripheral hepatic triads; the "portal" lobule, centered on the hepatic triads; and the hepatic acinus. Both the central vein and the hepatic traids are peripheral. It is the concept of the acinus that has proved to be the most useful for understanding liver functions (**Gray et al., 1987**). **B.** Modern concept of the lobes and segments of the human liver (**Skandalakis 1980**). C to F. Projection of liver lobes and segments based on the distribution of intrahepatic ducts and blood vessels (**Skandalakis et al., 1987**). **C** and **D**. Terminology of Couinaud (1954). **E** and **F**. Terminology of Healey and Schroy (1953). (CP, caudate process; RP and LP, right and left portions of the caudate lobe). **G**. Highly diagrammatic presentation of the segmental functional anatomy of the liver emphasizing portal distribution and hepatic veins (**Skandalakis &Gray 1994**). **H**. Exploded segmental view of the liver emphasizing the intrahepatic anatomy and hepatic veins (**Skandalakis &Gray 1994**).