



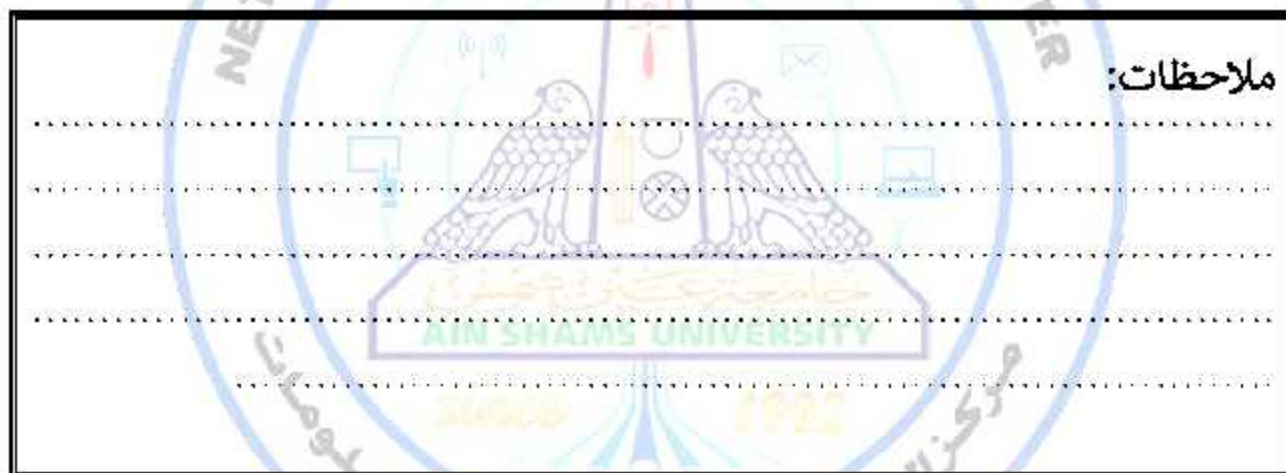
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تم رفع هذه الرسالة بواسطة / سنوي محمود عقل

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى

مسئولية عن محتوى هذه الرسالة.

ملاحظات:



**Randomized Comparative Study between
Using Harmonic Scalpel versus Cavitron
Ultrasonic Surgical Aspirator with Bipolar
Cautery in Living Donor Hepatectomy for
Living Donor Liver Transplantation**

Thesis

*Submitted for Partial Fulfillment of the M.D.
in General Surgery*

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سببنا أنك لا تعلم لنا
إلا ما علمتنا أنك أنت
العليم العظيم

صدق الله العظيم

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List of Abbreviations

Abb.	Full term
<i>CUSA</i>	<i>Cavitron ultrasonic surgical aspirator</i>
<i>CVP</i>	<i>Central venous pressure</i>
<i>ESLD</i>	<i>End-stage liver disease</i>
<i>HA</i>	<i>Hepatic artery</i>
<i>HCC</i>	<i>Hepatocellular carcinoma</i>
<i>HS</i>	<i>Harmonic scalpel</i>
<i>HTK</i>	<i>Histidine-tryptophan-ketoglutarate</i>
<i>IVC</i>	<i>Inferior vena cava</i>
<i>LDLT</i>	<i>Living donor liver transplantation</i>
<i>MRCP</i>	<i>Magnetic resonance cholangio- pancreatography</i>
<i>T.BIL</i>	<i>total bilirubin</i>

INTRODUCTION

The first human liver transplant from deceased donor was performed in 1963 by a surgical team led by Dr. Thomas Starzl from Denver, Colorado, United States (*Starzl et al., 1963*).

Because of the short supply of liver allografts from deceased donors, a reality that has spurred the development of living donor liver transplantation. The first report of successful LDLT was performed by Dr. Christoph Broelsch at the University of Chicago Medical Center in November 1989 for a pediatric recipient (*Quan and Wall, 1996*).

Living donor liver transplantation (LDLT) remains the only hope for management of patients with end-stage liver disease (ESLD) or selected patients with hepatocellular carcinoma (HCC) especially in countries where deceased donor LT is not approved legally or if there are shortage of cadaveric donor organs (*Smadi et al., 2017*).

Due to the risk of intraoperative blood loss from cut margin as well as postoperative complications (bile leakage, hemorrhage, and collection), method of liver transection represents the cornerstone of prevention of previous complications (*El Shobary et al., 2016*).

Avoiding excessive blood loss is the most important factor affecting peri-operative outcome, and there is a close

relationship between increasing blood loss during transection and an unfavorable result (*Aragon and Solomon, 2012*).

There are two steps in hepatic transection including division of liver parenchyma and perfect hemostasis. A variety of surgical techniques for parenchymal transection has been developed for safe and careful transection including clamp crushing (Kelly-clysis), harmonic scalpel, radiofrequency ablation-aided Habib 4X, LigaSure, cavitron ultrasonic surgical aspirator (CUSA), vascular staplers, microwave coagulators, or spray diathermy. Hemostasis can be performed by bipolar coagulation, ligatures, or hemoclips (*Yang et al., 2017*).

Still, there are no evidences to prove the ideal techniques for splitting the liver parenchyma of the donor (*Yang et al., 2017*).

Harmonic Scalpel, HS (Johnson and Johnson Medical, Ethicon, Cincinnati, OH, USA), also known as “Ultrasonically Activated Scalpel” or “Ultrasonic Coagulation Shears,” this instrument was introduced in the early 1990s. The ultrasound scissors system includes a generator handle for the scalpel, and the cutting device with scissors. The scissors are composed by a moveable blade and by a fixed longitudinal blade that vibrates with an ultrasonic frequency of 55,5 kHz (55.500 vibrations per second). HS can simultaneously cut and coagulate causing protein denaturation by destroying the hydrogen bonds in proteins and by generation of heat in vibrating tissue. This

generated heat denatures proteins and forms a sticky coagulum that covers the edges of dissection. Although the heat produces no smoke and thermal injury is limited, the depth of marginal necrosis is greater than that incurred by either the water jet or CUSA. The lateral spread of the energy is 500 micrometers (*Romano et al., 2012*).

Blood vessels up to 3-4 mm in diameter are coagulated. The tissue-cutting effect derives from a saw mechanism in the direction of the vibrating blades. The benefit of Harmonic scalpel without hepatic vascular inflow occlusion in open liver resection remains uncertain, and there is no randomized trial in the medical literature (*Hanyong et al., 2015*).

Cavitron Ultrasonic Surgical Aspirator, CUSA (Valleylab). The use in liver surgery of this instrument, also known as ultrasonic dissector, was described for the first time in the literature in 1979 by Hodgson. CUSA is a surgical system in which a pencil-grip surgical hand piece contains a transducer that oscillates longitudinally at 23 kHz and to which a hollow conical titanium tip is attached. The vibrating tip of the instrument causes explosion of cells with a high water content (just like hepatocytes) and fragmentation of parenchyma sparing blood and bile vessel because of their walls prevalently composed by connective cells poor of water but rich of intracellular bonds. The device is equipped by a saline solution irrigation system that cools the hand piece and washes the transection plane and by a constant suction system

that removes fragmented bits of tissue and permits excellent visualization (*Romano et al., 2012*).

CUSA has contributed to safe hepatectomy by making it easy to identify the vessels during parenchymal transection, but it has no function in tissue sealing, and meticulous ligation is required to avoid bleeding or bile leakage from the cut surface of the liver. Thus, establishment of rapid hemostasis is critical. The current findings suggest that treatment with a bipolar sealer can decrease effectively total blood loss, intraoperative blood loss during hepatic parenchymal dissection, and the need for transfusion (*Kaibori et al., 2013*).

The bipolar (BIP) sealer reportedly seals blood vessels in soft tissue and cut bone while keeping the surface temperature at <100 C. This device works by coupling RF energy from a standard electrosurgical generator with saline irrigation to conduct thermal energy. The thermal effect shrinks the collagen in the walls of veins and arteries, effectively stopping bleeding and oozing from the vessels without producing smoke or charring or burning tissue (*Kaibori et al., 2013*).

Simple saline-coupled BIP should be considered a safe and reliable technique for liver resection to decrease intraoperative hemorrhage and postoperative complications (*Guo et al., 2014*).

As a device for hemostasis, BIP has aroused increased interest because of its excellent hemostatic effect and low thermal damage to surrounding tissues. Because of these potential benefits, increasing numbers of surgeons are also applying BIP in hepatectomy as a preferred method (*Guo et al., 2014*).

AIM OF THE WORK

The aim of this study is to evaluate the feasibility, safety and effectiveness of using CUSA & bipolar diathermy for liver resection in living donor liver transplantation (LDLT) and its short-term benefits with follow up evaluation in comparison with using harmonic scalpel alone.

LIVING DONOR LIVER TRANSPLANTATION

With ever-increasing demand for liver replacement, supply of organs is the limiting factor and a significant number of patients die while waiting. Live donor liver transplantation has emerged as an important option for many patients, particularly small paediatric patients and those adults that are disadvantaged by the current deceased donor allocation system (*Goldaracena and Barbas, 2019*).

Ideally there would be no need to subject perfectly healthy people in the prime of their lives to a potentially life-threatening operation to provide transplantable organs. Donor safety imperative and cannot be compromised regardless of the implication for the recipient. The live donor procedures are considerably more complex than whole organ deceased donor transplantation and there are unique considerations involved in the assessment of any specific recipient and donor. Donor selection and evaluation have become highly specialized (*Nadalin et al., 2016*).

The outcomes after live donor liver transplantation have been at least comparable to those of deceased donor transplantation (*Olthoff et al., 2015a*).

Nevertheless, all efforts should be made to improve deceased donor donation so as to minimize the need for live