EVALUATION OF PERCUTANEOUS IMAGE GUIDED RADIOFREQUENCY THERMAL ABLATION IN THE TREATMENT OF HEPATOCELLULAR CARCINOMA

THESIS

Submitted for partial fulfillment of M.D. Degree in Radiodiagnosis

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To my wife, Rania

my dearest kids, Suzanna and Laila

Thank you for being there for me

Abstract

Hepatocellular carcinoma is considered to be one of the most common malignancies world wide.

Its treatment is based on : transplantation ,resection, ablation, and embolization. .

Transplantation remains the treatment of choice for patients with early HCC; However, limited organ availability makes this treatment unavailable for most patients.

The vast majority of patients with HCC are not suitable for any of the surgical treatment options; therefore, adjuvant, less invasive treatments have to be considered. These include intratumoral injection of ethanol or acetic acid and thermal ablation with RF, laser, microwaves, or cryosurgery.

RF ablation (RFA) is a simple, effective, and less expensive technique with a low morbidity compared with surgical treatment producing significant long-term survival rates and excellent local control and with low incidence of major complications .

Key Words:

Hepatocellular carcinoma-Image guided-Radiofrequency ablation.

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LIST OF ABBREVIATIONS

AASLD	American Association for the Study of Liver Diseases
AFP	α-fetoprotein
ALP	alkaline phosphatase
ALP	Serum alkaline phosphatase
ALT	alanine transaminase
ASCO	American Society of Clinical Oncology
AST	aspartate transaminase
CLIP	Cancer of the Liver Italian Program
CT	Computed Tomography
CTAP	CT arterial portography
CTHA	CT hepatic arteriography
CUPI	Chinese University Prognostic Index
DCP	Des-Gamma-Carboxy Prothrombin
DN	dysplastic nodules
ER	estrogen receptors
HBsAg	hepatitis B surface antigen
HBV	Hepatitis B virus
HCC	Hepatocellular carcinoma
HCV	Hepatitis C virus
IFN	interferon
IGF-2	insulin-like growth factor 2
LDH	lactic acid dehydrogenase
LITT	Interstitial laser-induced thermotherapy
MCL	mid clavicular line
MRI	Magnetic Resonance Imaging
MW	Microwave
NSGCT	nonseminomatous germ cell tumors
PEI	Percutaneous Ethanol injection
pHW	physiological saline (hot water)
PVA	polyvinyl alcohol particles
PZA	pyrazoloacridine
RF	radiofrequency
RN	regeneration nodule
TACE	transarterial chemoembolization
TGF-B_1	Transforming growth factor-B_1
TGF-α	Transforming growth factor-α
TNM	tumor-node-metastasis
US	Ultrasonography
VER	modified estrogen receptors

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ANATOMY OF THE LIVER

DESCRIPTIVE ANATOMY OF THE LIVER

The anatomy of the liver according to its external appearance identifies a superior or diaphragmatic surface and an inferior or ventral surface. ***(Majno et al., 2005)***

On the superior aspect the falciform ligament separates the gland into a larger right lobe and a smaller left lobe ***(Majno et al., 2005.)***

The inferior surface is more varied: the round ligament continues into with the umbilical portion of the left portal vein (at an anatomical landmark called Rex's recessus) ***(Majno et al., 2005)***

The "hepatic pedicle" containing the portal vein, the hepatic artery and the bile duct spreads out, near the liver, in a space called the "porta hepatis or hepatic hilum" (defined by the bifurcation of the portal vein) and divides into a shorter right pedicle and a longer left pedicle.The left pedicle runs almost horizontal and separates a quadrate lobe anteriorly and a caudate lobe posteriorly. ***(Majno et al., 2002).***

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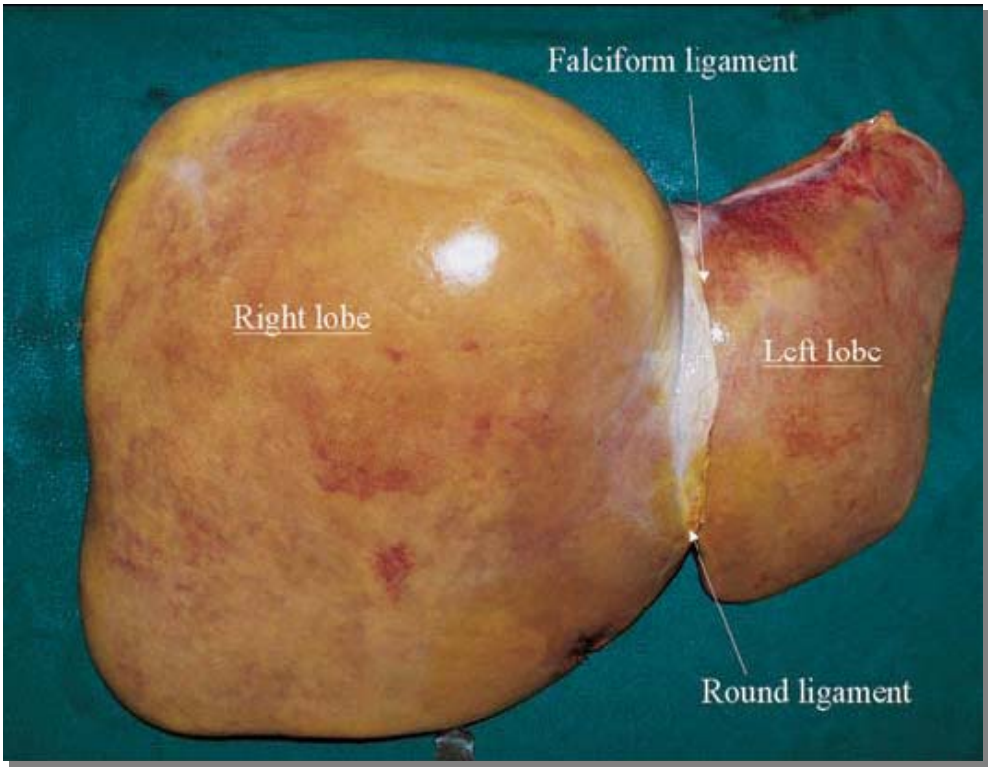

Fig. 1: Superior (diaphragmatic) aspect of the liver (Majno et al., 2005)

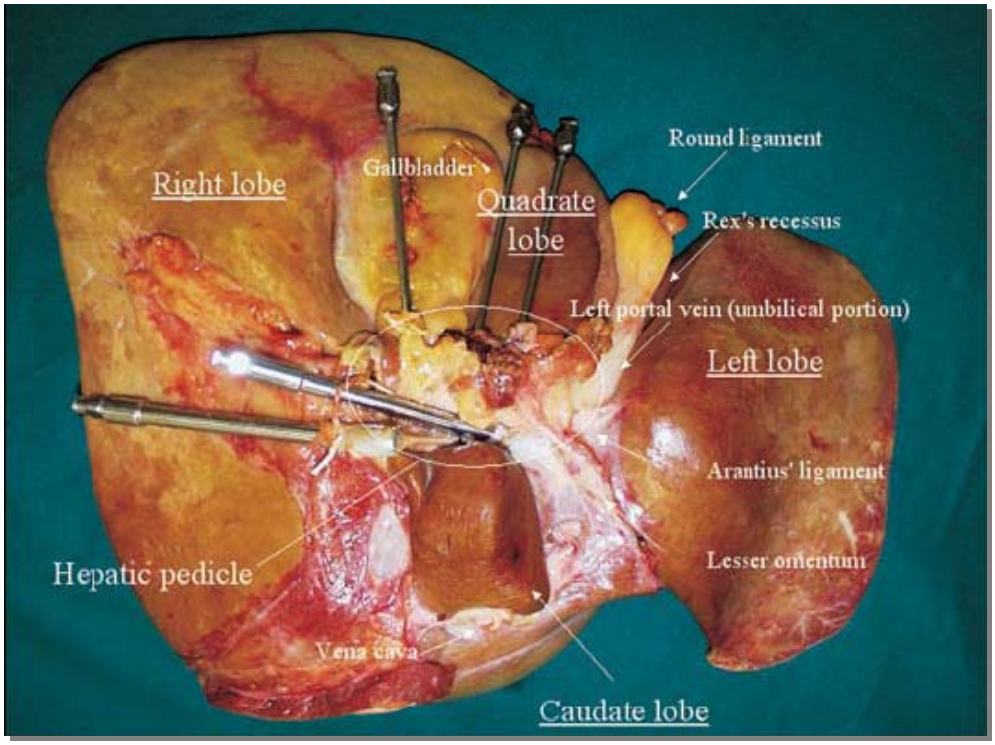

Fig. 2: Inferior aspect of the liver. (Majno et al., 2005)

THE FUNCTIONAL OR VASCULAR ANATOMY

The merit of recognizing simplified pattern of the vascular structure of the liver has to be credited to the French anatomist and surgeon Claude Couinaud ***(Couinaud, 1957)***.

The Couinaud classification divides the liver into 8 independent segments, each of which has its own vascular flow, outflow and biliary drainage. Because of this division into self-contained units each can be resected without damaging those remaining. In most cases, the vascular outflow for each segment is provided by three hepatic veins at its periphery. ***(Majno et al., 2005)***

It assumes that the blood enters the liver from the portal vein (the arteries and the bile ducts follow the branches of the portal vein) and is collected by three hepatic veins (left, middle and right) inserting into the inferior vena cava. ***(Majno et al., 2005)***

The main portal vein divides into two branches, right and left, defining a right liver and a left liver. The middle hepatic vein drains the liver from the main bifurcation. ***(Majno et al., 2005)***

On the right, the right portal vein divides into two second order sectorial branches defining a right anterior sector and a right posterior sector, separated by the right hepatic vein. The third-order division of the (sectorial) portal branches will separate each sector into two segments. ***(Majno et al., 2005)***

On the left, although sectors can be recognized on embryological grounds, it is simpler to remember that the portal vein describes an arch

towards the round ligament, and that the concavity of this arch embraces one segment (limited on the right by the middle hepatic vein), and the convexity of the arch two segments, separated by the left hepatic vein. ***(Majno et al., 2005)***

A last segment is constituted by the liver tissue that lies between the posterior aspect of the portal bifurcation and the vena cava. This segment extends from the left (where it has a recognizable external identity in the form of the caudate lobe) to the right, around the vena cava, up to the confluence of the hepatic veins. This segment is fed by a series of smaller portal branches originating from the portal bifurcation before the takeoff of the right and left portal branches, and its parenchyma is drained by a variable number of separate hepatic veins directly into the vena cava. ***(Majno et al., 2005)***

The plane of separation between the right and the left liver can be approximated as a plane going from the gallbladder fossa to the vena cava in which runs the middle hepatic vein. ***(Majno et al., 2005)***