# THE ROLE OF POSITRON EMISSION TOMOGRAPHY/ COMPUTED TOMOGRAPHY IN LIVER MALIGNANCY

*Essay*

*Submitted for partial fulfillment of Master degree in Radio-diagnosis*

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# *LIST OF ABBREVIATION*

| | |
|---|---|
| **ACFs** | Attenuation correction factors |
| **AFP** | Alfa feto protein |
| **BGO** | Bismuth germinate |
| **BMI** | Body mass index |
| **11C-ACT** | 11 choline acetate |
| **CA** | Celiac artery |
| **CBD** | Common Bile Duct |
| **CC** | Cholangiocarcinoma |
| **CD** | Cystic Duct |
| **CEA** | Carcinoembryonic antigen |
| **CHD** | Common Hepatic Duct |
| **CM** | Contrast Media |
| **CNS** | Central nervous system |
| **CRC** | Colorectal cancer |
| **CT** | Computed tomography |
| **CTA** | CT Angiography |
| **CTAC** | CT-based attenuation correction |
| **DAS** | Data acquisition system |
| **3D** | Three-dimensional |

| | |
|---|---|
| **2D** | Two-dimensional |
| **DNA** | Deoxynucleic acid |
| **ECT** | Emission computed tomography |
| **18-F** | 18-Fluorine |
| **FCAT** | Federative Committee on Anatomical Terminology |
| **FDA** | Food And Drug Admistrition |
| **18-FDG** | 18-flourodeoxyglucose |
| **Fig.** | Figure |
| **GDA** | Gasteroduodenal Artery |
| **GI** | Gastero-intestinal |
| **GLUT** | Glucose transporters |
| **GSO** | Gadolinium silicate |
| **H+** | Hydrogen ion |
| **HA** | Hepatic artery |
| **HBV** | Hepatitis B Virus |
| **HCC** | Hepatocellular Carcinoma |
| **HCV** | Hepatitis C Virus |
| **HU** | Hounsfield Unit |
| **IV** | Intra-venous |
| **IVC** | Inferior Vena Cava |
| **KeV** | Killo Electron Volt |

| | |
|---|---|
| **KV** | Killo Volt |
| **LGA** | Left Gastric Artery |
| **LHA** | Left Hepatic Artery |
| **LHD** | Left Hepatic Duct |
| **LHV** | Left Hepatic Vein |
| **LOR** | Line Of Response |
| **LSO** | Lutetium oxyorthosilicate |
| **MDCT** | Multi–detector row computed tomography |
| **MHA** | Middle Hepatic Artery |
| **MHV** | Middle Hepatic Vein |
| **MIP** | Maximum Intensity Projection |
| **MRI** | Magnetic resonance imaging |
| **mSV** | Milliseviert |
| **PET** | Positron emission tomography |
| **PET/CT** | Positron emission tomography/Computed Tomography |
| **PHA** | Proper Hepatic Artery |
| **PSF** | Point spread function. |
| **PV** | Portal Vein |
| **RFA** | Radiofrequency Ablation |
| **RHA** | Right Hepatic Artery |

| | |
|---|---|
| **RHD** | Right Hepatic Duct |
| **RHV** | Right Hepatic Vein |
| **RPPV** | Right posterior portal vein |
| **RPV** | Right portal vein |
| **SPECT** | Single photon emission computed tomography |
| **SUV** | Standardized uptake value. |
| **SUVmax** | Maximum Standardized uptake value |
| **TACE** | Transcatheter Arterial Chemoembolization |
| **TNM** | Tumor, node, metastasis |
| **US** | Ultrasound |
| **$\beta^+$** | Positron |
| **$\beta^-$** | Electron |

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# INTRODUCTION AND AIM OF THE WORK

Cancer is a major cause of death in the developed world, and is becoming a significant issue for developing countries as they adopt a more westernized lifestyle, including greater consumption of alcohol and tobacco**.** ***( Jones et al., 2006).***

The incidence of primary liver malignancies has significantly increased over the last 20 years. Hepatocellular carcinoma (HCC) is globally the commonest liver primary, and cholangiocarcinoma the second commonest primary liver tumour. Cholangiocarcinoma accounts for 3% of all gastrointestinal cancers. Mesenchymal liver tumors are rare, but include hepatic angiosarcoma and primary hepatic lymphoma ***(Vauthey and Blumgart , 2009).***

The most common malignant tumors in the liver are metastases from wide variety of neoplasms, that most frequently are carcinomas from colorectal, breast, and lung primaries. Often discovered as solitary, liver metastases can be effectively treated with surgery **(** ***Arciero and Sigurdson, 2008).***

Treatment in oncology relies on correct tumor staging for patients with malignant diseases. All morphologic imaging modalities, including CT, ultrasound, conventional radiography, and MRI, share the same mechanism for detecting malignant diseases ***( Kuehl et al., 2007).***

The role of cross-sectional imaging can include the diagnosis of malignancy, staging of confirmed cancers, assessment of response to treatment, planning of neoadjuvant treatment (such as radiotherapy) and surveillance both pre- and post-operatively. PET-CT allows an evaluation of the physiological and biochemical processes underlying malignant disease and consequently offers a new perspective in the treatment of intra-abdominal malignancies ***(Garcea et al., 2009).***

[18F]-Fluoro-2-deoxy-D-glucose-positron-emission/computed-tomography imaging (FDG PET/CT) is currently one of the most used oncological staging and therapy follow-up techniques and is worldwide used and reimbursed for a wide variety of cancers **(*Nehmeh and Erdi* , 2008).**

## AIM OF THE WORK

The aim of the work is to highlight the role of PET/CT in the evaluation of liver malignancies.

# Anatomy Of The Liver And Its Vascular Supply

The liver is the largest abdominal viscera, occupying a substantial portion of the upper abdominal cavity. It occupies most of the right hypochondrium and epigastrium, although it frequently extends into the left hypochondrium as far as the left lateral line. In adults the liver weights 2% of body .It is composed largely of epithelial cells (hepatocytes), which are bathed in blood derived from the hepatic portal veins and hepatic arteries***(Standering ,2008).***

## *Gross morphology*

## *Hepatic Surfaces :*

The liver having superior, anterior, right, posterior and inferior surfaces, and has a distinct inferior border. However, superior, anterior, right surfaces are continuous with no definable borders ***(Standring et al., 2008).***

The gross anatomical appearance of the liver has been divided into right, left, caudate and quadrate lobes by the surface peritoneal and ligamentous attachments. The falciform ligament superiorly and the ligamentum venosum inferiorly, mark the division between right and left lobes. On the posterior surface, to the right of the groove formed by the ligamentum venosum, there are two prominences separated by the porta hepatis. The quadrate lobe lies anteriorly, the caudate lobe posteriorly. The gallbladder usually lies in a shallow fossa to the right of the quadrate lobe ***(Standring et al., 2008).***

## Superior surface: (Fig. 1.1a&b)

A sharp, well-defined margin divides the inferior from the superior in front the other margins are rounded. The superior surface is attached to the diaphragm and anterior abdominal wall by a triangular or falciform fold of peritoneum, the falciform ligament, in the free margin of which is a rounded cord, the ligamentum teres (*obliterated umbilical vein*). The line of attachment of the falciform ligament divides the liver into two parts, termed the right and left lobes, the right being much larger ***(Standring et al., 2005).***

The superior surface is the largest surface and lies immediately below the diaphragm, separated from it by peritoneum except for a small triangular area where the two layers of falciform ligament diverge. It is related to the right diaphragmatic pleura, base of the right lung, pericardium, ventricular part of the heart, part of the left diaphragmatic pleura and base of the left lung ***(Standring et al., 2008).***

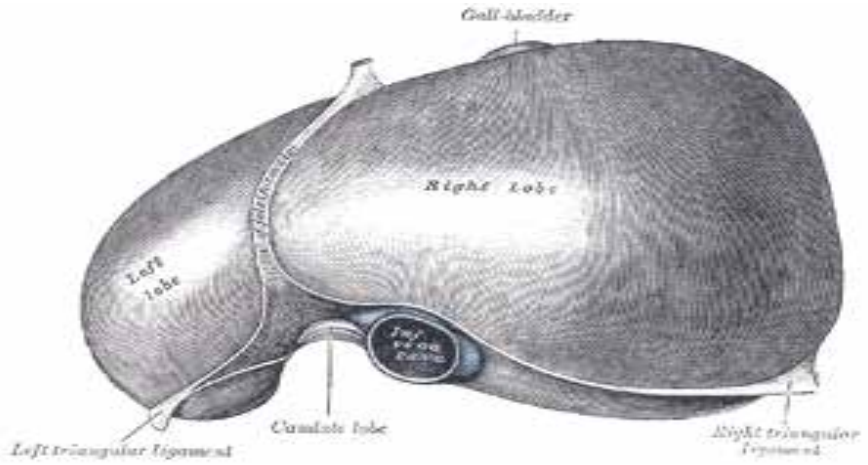


**Fig. 1.1a:** The superior surface of the liver. **(Quoted From Standring et al., 2005).**