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Mohamed Ghonim

Contents

List of Figures

List of Tables

LIST OF ABBREVIATIONS

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	Kilo 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
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
B+	Positron
B-	Electron

Introduction

Liver masses are increasingly being identified due to the widespread use of imaging modalities such as ultrasonography (US), computed tomography (CT), and magnetic resonance imaging. **(Assy et al., 2009).**

Benign hepatic tumors include a broad spectrum of lesions.They are increasingly reported with the widespread use of sensitive imaging studies. They usually occur in asymptomatic patients with or without underlying liver disease.The most common benign hepatic tumors include cavernous hemangioma, focal nodular hyperplasia, hepatic adenoma, and nodular regenerative hyperplasia (**Choi and Nguyen, 2005)**.

Malignant tumours arising in the liver can be primary, in the form of hepatocellular carcinoma, or secondary, resulting from dissemination of a primary tumour outside the liver. Metastatic disease involving the liver represents a common challenge in oncology. The liver is the most common site of metastases that arise from gastrointestinal malignancies; other primary sites of origin include breast, lung, pancreas, and melanoma (**Choi, 2006**).

Detection and characterization of liver lesions often present a diagnostic challenge to the radiologists **(Namasivayam et al., 2007)**.

Functional imaging with positron emission tomography (PET) is playing an increasingly important role in the diagnosis and staging of malignant disease (**Blodgett et al., 2007**).

Positron emission tomography with FDG is a functional imaging modality that identifies malignant tumor tissues by glucose uptake mechanisms. It not only can be used to characterize lesions in the liver but also can be used to screen the body for the presence of other remote metastases **(Grassetto et al., 2009).**

Combining PET with a high-resolution anatomical imaging modality such as computed tomography (CT) can help both identify and localize functional abnormalities (**Townsend, 2008**).

Aim Of The Work

The aim of this work is to highlight the role of PET CT in better characterization of hepatic focal lesions.

ANTOMY OF THE LIVER

The liver is the largest of the abdominal viscera, occupying a substantial portion of the upper abdominal cavity. It performs a wide range of metabolic activities necessary for homeostasis, nutrition and immune defense. It is composed largely of epithelial cells (hepatocytes), which are bathed in blood derived from the hepatic portal veins and hepatic arteries. There is continuous chemical exchange between the cells and the blood.

Hepatocytes are also associated with an extensive system of minute canals, which form the biliary system into which products are secreted. **(Borley et al., 2008)**

Surfaces of the liver and their relations :

The liver has two surfaces, the diaphragmatic surface and the visceral surface. The diaphragmatic surface is smooth and flat posteriorly and has a smooth, rounded upper surface with a large dome for the right hemidiaphragm and a smaller dome for the left hemidiaphragm. The diaphragmatic surface ends anteriorly in the inferior border of the liver. This lies at the costal margin laterally to within about 4cm from the midline, the site of the gall bladder notch.

Medial to this, the inferior border ascends less obliquely than the costal margin and lies below it as it crosses the midline to meet the costal margin of the left side at approximately the eighth costal cartilage. The lateral extend of the left lobe is

variable: it may extend only to the mid line or may surround the stomach or spleen to reach left lateral abdominalwall (***Rayan, 2004***).

In addition to the notch for gallbladder, the inferior border is marked by a notch for the ligamentum teres. This ligament is the obliterated remnant of the left umbilical vein, which carries blood from the placenta to the fetus. It passes, with small paraumblical veins, from the umbilicus to the inferior border of the liver in the free edge of a crescentic fold of peritoneum called the falciform ligament (***Rayan, 2004***).

The posteroinferior, or visceral, surface of the liver is marked by an H-shaped arrangement of structures. The crossbar of the H is made by the horizontal hilum of the liver called the porta hepatis. This is the entry site of the left and right hepatic arteries and portal veins, and also the exit of the right and left hepatic ducts. There are also autonomic nerves and lymph vessels. The gallbladder in its bed, together with the inferior vena cava in a deep groove or tunnel, forms the right vertical part of the H. These are separated by the caudate process. The left vertical part of the H is formed by the ligamentum teres and ligamentum venosum. The ligamentum teres runs to its attachment to the left portal vein in the left extremity of porta hepatis. This is continuous with the fissure for ligamentum venosum. This is a deep fissure lined by peritoneum, with the obliterated remnant of ductus venosum at its base. The ductus venosum shunts blood from the left umbilical vein to IVC in the fetus, bypassing the liver. At the upper end of the fissure the ligamentum venosum curves laterally to attach to either the left hepatic vein or IVC (***Rayan, 2004***).