Utility of C-Arm CT in Detection of Hepatocellular Carcinoma During Trans Arterial Chemoembolization

Thesis

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List of Contents

List of Tables

Table No.	Title	Page No.

List of Figures

List of Figures Cont...

List of Figures Cont...

List of Abbreviations

Abb.	Full term
2D	*Two dimensional*
3D	*Three-dimensional*
CBCT	*Cone beam computed tomography*
CHA	*Common hepatic artery*
CT	*Computed tomography*
DSA	*Digital subtraction angiography*
FOV	*Field of view*
GDA	*Gastroduodenal artery*
HCC	*Hepatocellular carcinoma*
LGA	*Leftgastric artery*
MDCT	*Multidetector CT*
MIP	*Maximum intensity projection*
MR	*Magnetic resonance*
MRI	*Magnetic resonance imaging*
PHA	*Proper hepatic artery*
RHA	*Right hepatic artery*
SA	*Splenic artery*
TACE	*Transarterial chemoembolization*

INTRODUCTION

Hepatocellular carcinoma (HCC) is the primary liver cancer, which is considered the sixth most common cancer in the world and the second leading cause of cancer related death. Transarterial chemoembolization (TACE) is the officially recommended therapeutic option for many patients. Hepatocellular carcinoma is unique among malignancies in having tumor characteristics on cross-sectional multiphase contrast CT or MR imaging that allow for a highly accurate diagnosis of HCC without an invasive biopsy ***(Manini et al., 2014).***

The diagnosis is based on the qualitative or visual appreciation of differences in attenuation on CT and signal intensities on MRI of the HCC with respect to surrounding liver parenchyma ***(Leoni et al., 2010).***

Typical HCC demonstrates arterial enhancement followed by washout at computed tomography (CT) ***(Parente et al., 2014).*** By magnetic resonance (MR) imaging HCC usually appears as a hypo intense nodule at T1-WI comparing to the surrounding parenchyma, On T2-WI it shows a mild hyper intense signal in post contrast imaging, enhancement is usually arterial with rapid "washout," becoming hypointense to the remainder of the liver with restricted diffusion.***(Bartolozzi et al., 2011).***

One of the most common reasons for early recurrence after treatment is the inability to identify all lesions including the small or occult tumors prior to treatment. Therefore, detection of all tumor nodules, including the smaller HCCs (<3 cm), is essential in achieving best treatment results ***(Deschamps et al., 2010).***

Unfortunately, angiography frequently cannot detect small HCC lesions. In addition, conventional triphasic contrast enhanced computed tomography (CT) and magnetic resonance imaging (MRI) are less sensitive in detecting small lesions ***(Deschamps et al., 2010).***

Another area of controversy is the optimal management of patients in whom CT or MRI detects a nodule with some but not all the hallmark features of HCC. The differential diagnosis for such nodules includes HCC, non-HCC malignancy, and non malignant entities ***(Bruix and Sherman, 2011).***

Detection rates of HCCs may depend on the tumor size, C-arm CBCT protocol. Generally, C-arm CBCT shows additional HCCs that are not evident on CT, MRI, and angiography, so the sensitivity of HCC detection is increased through the use of CBCT. But, non-tumorous lesions mimicking HCCs are frequently seen on C-arm CBCT, resulting in reduced specificity ***(Higashihara et al., 2012).***

C-arm hepatic artriography the most common technique for intraprocedural HCC detection and is recommended as part of the Cardiovascular and Interventional Radiological Society of Europe/ Society of Interventional Radiology protocol guidelines for selective trans arterial chemoembolization (TACE) due to it provides substantially more information than digital subtraction angiography (DSA) because it delineates the exact location of a target tumor in relation with the surrounding structures, and direct injection of contrast material into the hepatic artery allows easy and accurate tracing of the tumor feeders on the CT images ***(Higashihara et al., 2012).***

AIM OF THE WORK

The objective of this study is to evaluate the sensitivity of cone beam computed tomography (CBCT) in detecting hepatocellular carcinoma (HCC) tumors and their feeding vessels during transarterial chemoembolization (TACE).

Chapter 1

ANATOMY OF THE LIVER

Gross Anatomy of the Liver

I) Hepatic lobes and segmental anatomy of the liver:

A- Anatomical lobes of the liver:

1. Right lobe:

The right lobe of the liver is the largest in size and contributes to all surfaces; it exceeds the left lobe by a ratio of 6:1. It occupies the right hypochondrium and is bordered on its upper surface by the falciform ligament, on its posterior surface by the left sagittal fossa, and in front by umbilical notch. It's inferior and posterior surfaces are marked by three fossae; the porta hepatis, the gall bladder fossa, and the inferior vena cava. A congenital variant, Riedel's lobe, can sometimes be seen as an anterior projection of the liver ***(Standring, 2008).***

2. Left lobe:

The left lobe of the liver is the smaller of the two main lobes. It lies in the epigastric and left hypochondrium regions. Its upper surface is convex. It's under surface includes the gastric impression and omental tuberosity. The medial segment

of the left lobe is oblong and situated on the postero-inferior surface of the left lobe. In front it is bounded by the anterior margin of the liver, behind by the porta hepatis, on the right by the fossa for the gall bladder, and on the left by the fossa for the umbilical vein ***(Standring, 2008).***

3. Caudate lobe:

The caudate lobe is a small lobe visible on the posterior surface. It is bounded on the left by the fissure for ligamentum venosum, below by the porta hepatis, on the right by the groove for the inferior vena cava. Above it continues into the superior surface. Below and to right, it is connected to the right lobe by a narrow caudate process. In gross anatomical descriptions this lobe is said to arise from the right lobe, but it is functionally separate ***(Standring, 2008).***

4. Quadrate lobe:

The quadrate lobe is only visible from the inferior surface, it appears somewhat rectangular. It is bounded on the right by the fossa for the gall bladder, on the left by the fissure for ligamentum teres, in front by the inferior border, and posteriorly by the porta hepatis. In gross anatomical description it is said to be a lobe arising from the right lobe, however, it is functionally related to the left lobe ***(Standring, 2008).***