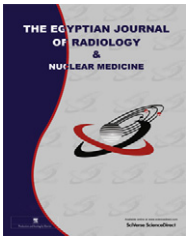
The Egyptian Journal of Radiology and Nuclear Medicine (2012) **43**, 361–368

Egyptian Society of Radiology and Nuclear Medicine

The Egyptian Journal of Radiology and Nuclear Medicine

www.elsevier.com/locate/ejrnm
www.sciencedirect.com



ORIGINAL ARTICLE

Value of dynamic multidetector CT in different grades of hepatocellular carcinoma

Ahmed Shokry

Diagnostic Radiology Department, National Cancer Institute, Cairo University, Cairo, Egypt

Received 5 June 2012; accepted 10 June 2012
Available online 9 July 2012

KEYWORDS

Hepatocellular carcinoma;
Liver;
Multidetector

Abstract *Purpose:* To evaluate dynamic multidetector CT (MDCT) in assessment of grades of hepatocellular carcinoma (HCC).
Patients and methods: Forty patients of HCC were assessed. Enhancement patterns were correlated with pathological grades.
Results: Three enhancement patterns were:

1. Hyperattenuating lesions in portal venous phase.
2. Hypoattenuating lesions in all phases.
3. Hyperattenuating lesions in arterial phase.

Conclusion: Arterial and portal biphasic imaging was the most informative in assessment of tumor grades. High grade lesions were hyperattenuating in arterial phase.
At initial evaluation, triphasic imaging is advisable, while in diagnosed cases and on follow up, biphasic imaging could be satisfactory.

1. Introduction

Hepatocellular carcinoma (HCC) is the main primary liver cancer and is considered as the third most common cause of cancer mortality worldwide. The major risk factor for hepatocellular carcinoma is chronic viral hepatitis, cirrhosis, consumption of alcohol and hemochromatosis. Males are affected more than females and it is most common between the ages of 30 and 50 years (1).

The prognosis of well differentiated HCCs is good following resection or local therapy, while the prognosis of poorly differentiated HCCs is poor due to greater tendency for vascular invasion and metastasis (2,3).

The rising incidence of hepatocellular carcinoma, combined with decrease of available liver grafts has led to refined selection criteria for liver transplantation candidates. Hence, prognostic criteria of HCC include not only size and number of tumor nodules, but also the presence of micro- and macro-vascular invasions, satellite nodules, and grade of differentiation (4).

E-mail address: ahmedmshokry@yahoo.com
Peer review under responsibility of Egyptian Society of Radiology and Nuclear Medicine.

ELSEVIER Production and hosting by Elsevier

0378-603X © 2012 Egyptian Society of Radiology and Nuclear Medicine. Production and hosting by Elsevier B.V.
Open access under CC BY-NC-ND license. http://dx.doi.org/10.1016/j.ejrnm.2012.06.002

The lesions were classified histologically into 4 grades according to the World Health Organization grading system: grade I (well differentiated), grade II moderately differentiated), grade III (poorly differentiated) and grade IV (undifferentiated/anaplastic) (5).

Non-invasive diagnostic imaging has gained wide acceptance for the imaging of HCC with the assessment of tumor vascularity (6).

There were only a limited number of studies that correlate between dynamic MDCT and pathological tumor grades (7,8).

The purpose of this study was to evaluate the different phases of dynamic MDCT in the assessment of different grades of HCC.

2. Patients and methods

2.1. Study population

A retrospective study was conducted on 40 patients (18 females and 22 males with ages ranging from 39 years to78 - years, mean age 61 years) with pathologically proven hepatocellular carcinoma that underwent dynamic MDCT studies at National Cancer Institute, Cairo University. Cases with portal vein thrombosis were excluded from this study. The histopathology was diagnosed by biopsy taken by needle or from surgery.

No informed consent was taken since it was a retrospective study, approved by institutional ethics committee.

2.2. Imaging methods and MDCT imaging protocol

CT studies were performed by using a 64 MDCT scanner (Light speed 64-slice VCT, GE Healthcare, Milwaukee, WI, USA) before and after IV contrast medium administration. The precontrast series was taken by using a 5 mm slice thickness.

The post-contrast study was done using about 120–180 ml of low osmolar non-ionic contrast medium (iohexol, Omnipaque 300; Amersham Health, Oslo, Norway) at a flow rate of 5 ml/s. The volume of contrast material was calculated according to the body weight of the patient (2 mL of contrast material per kilogram of body weight).

MDCT scan was performed with the following acquisition parameters: 200 mAs, 120 kVp, 512×512 matrix, 1.1 pitch, 64×0.625 mm collimation, 2 mm slice thickness, 0.6 mm reconstruction increment.

A quadruple phase protocol that included unenhanced, hepatic arterial, portal venous and hepatic venous phases was used.

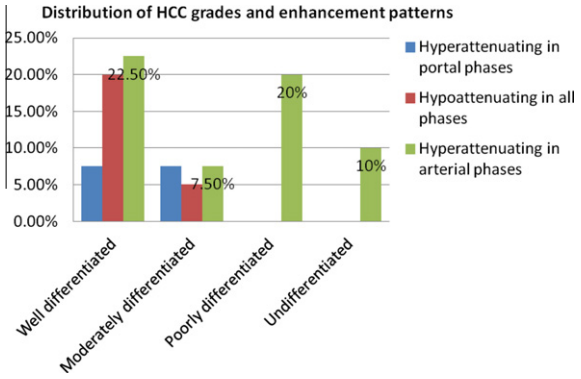


Fig. 1 Distribution of pathological grades and the three enhancement patterns in this study. Hyperattenuating lesions in arterial phases were seen in all tumor grades.

All patients received oral contrast material 1 h before CT examination, followed by IV injection of nonionic contrast medium using power injector.

The arterial phase, portal venous phase and hepatic venous phase were taken at 20, 60 and 120 s, respectively, following IV contrast injection. Automated bolus tracking with bolus detection at the level of the descending aorta above the diaphragm ensured accurate timing of the data acquisition in arterial phase.

2.3. Image analysis and interpretation

The HCC lesions were divided into 4 grades: grade 1 (well differentiated), grade 2 (moderately differentiated), grade III (poorly differentiated) and grade IV (undifferentiated/anaplastic).

Different images were assessed for contrast enhancement patterns in different phases and correlated with the pathological tumor grade.

Three phases (hepatic arterial, portal venous and hepatic venous phases) of dynamic MDCT scan were studied and evaluated separately and in combination. The attenuations of lesions in unenhanced scan and in the 3 phases of postcontrast dynamic CT scan were analyzed, compared with surrounding liver parenchyma and categorized as hyperattenution (or high density), isoattenuation (or iso density) and hypoattenuation (or low density) by visual inspection.

Arterial hypervascularity was defined as hyperattenuation of the lesion compared to liver parenchyma on the arterial phase. Washout was defined as increased lesion hypoattenua-

Table 1 The distribution of dynamic MDCT contrast enhancement patterns according to pathological grades of HCC lesions.

Pathological grading of HCC	Hyperattenuating lesions in portal venous phases (Pattern 1)	Hypoattenuating lesions in all phases (Pattern 2)	Hyperattenuating lesions in arterial phases (Pattern 3)	Total
Well differentiated	3 (7.5%)	8 (20%)	9 (22.5%)	20 (50%)
Moderately differentiated	3 (7.5%)	2 (5%)	3 (7.5%)	8 (20%)
Poorly differentiated	0 (0%)	0 (0%)	8 (20%)	8 (20%)
Undifferentiated	0 (0%)	0 (0%)	4 (10%)	4 (10%)
Total	6 (15%)	10 (25%)	24 (60%)	40 (100%)