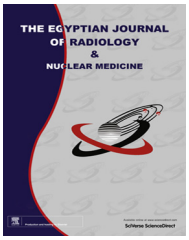
The Egyptian Journal of Radiology and Nuclear Medicine (2013) **44**, 417–423

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

Preoperative assessment of vascular invasion in exocrine pancreatic cancer by multidetector CT

Ahmed Shokry *, Omnia Mokhtar, Amr Salah, Mohammed Gomaa, Ayman Abdelmottelb

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

Received 21 June 2012; accepted 13 March 2013
Available online 3 May 2013

KEYWORDS

Pancreatic cancer;
Vascular invasion;
MDCT

Abstract *Purpose:* To evaluate multidetector CT (MDCT) signs of vascular invasion in pancreatic carcinoma.
Patients and methods: Retrospective review of preoperative dynamic MDCT of 42 patients with pathologically proven pancreatic carcinoma.
Results: Surgically confirmed invaded vessels were 19 arteries and 33 veins. Multiple signs of vascular invasion were assessed.
Conclusion: Significant advances have been made in the ability of MDCT to visualize pancreatic cancer and to stage disease when close attention is paid to technique with special attention to multiple signs of vascular invasion.

1. Introduction

Primary prevention is the most effective approach to reduce the incidence of pancreatic cancer because it is the fourth leading cause of cancer related death in the world with an overall 5-year survival rate of less than 4% (1). Currently, surgery remains the only option for cure (2).

The poor prognosis is usually due to late diagnosis (3). Exocrine tumors are the most common types of pancreatic cancer with the adenocarcinoma representing about 90% of cases (4).

Surgical resection is the optimal curative treatment; however, only 20% of patients have resectable disease at diagnosis (1,2,5,6).

Despite the advances of imaging, CT scan remains the main imaging modality, although about 25–30% of patients who are thought to have resectable lesions at CT have unresectable lesions at surgery. There is no evidence of the optimal preoperative imaging modality for evaluation of patients with suspected pancreatic cancer; however, assessment of vascular invasion is an important issue for determining resectability as resectability depends on the type of the vessel involved

* Corresponding author. Mobile: +20 1207321719; Tel.: +20 227539088.
E-mail addresses: ahmedmshokry@yahoo.com (A. Shokry), omnia-n44@yahoo.com (O. Mokhtar), amr_nayal@yahoo.com (A. Salah), mohammedgomaa555@yahoo.com (M. Gomaa), amn_med09@yahoo.com (A. Abdelmottelb).
Peer review under responsibility of Egyptian Society of Radiology and Nuclear Medicine.

ELSEVIER Production and hosting by Elsevier

0378-603X © 2013 Production and hosting by Elsevier B.V. on behalf of Egyptian Society of Radiology and Nuclear Medicine.
Open access under CC BY-NC-ND license. http://dx.doi.org/10.1016/j.ejrnm.2013.03.006

Table 1 MDCT signs of involved arteries.

MDCT signs	SMA	CA	HA	Total
> 50% Circumferential involvement	7	4	1	12
Vascular infiltration (wall irregularity)	2	1	1	4
Diameter stenosis	2	1	–	3
Vascular occlusion	–	–	–	–

SMA, superior mesenteric artery; CA, celiac artery; HA, hepatic artery.

Table 2 MDCT signs of involved veins.

MDCT signs	SMV	PV	Total
> 50% circumferential involvement	8	2	10
Vascular infiltration (wall irregularity)	8	4	12
Diameter stenosis	7	2	9
Vascular occlusion	2	–	2

SMV, superior mesenteric vein; PV, portal vein.

Table 3 Number and percentages of MDCT signs in involved arteries.

MDCT signs	SMA	CA	HA	Total	%
Vascular contact	7/11	4/6	1/2	12/19	63.1
Vascular infiltration (wall irregularity)	2/11	1/6	1/2	4/19	21.1
Diameter stenosis	2/11	1/6	0/2	3/19	15.8
Vascular occlusion	0/11	0/6	0/2	0/19	0

SMA, superior mesenteric artery; CA, celiac artery; HA, hepatic artery.

Table 4 Number and percentages of MDCT signs in involved veins.

MDCT signs	SMV	PV	Total	%
> 50% Vascular contact	8/21	2/4	10/33	30.3
Vascular infiltration (wall irregularity)	10/21	2/4	12/33	36.4
Diameter stenosis	7/21	2/4	9/33	27.3
Vascular occlusion	2/21	0/4	2/33	6

SMV, superior mesenteric vein; PV, portal vein.

and the degree of vascular involvement. Recently, multidetector CT (MDCT) allowed improvement in assessment of preoperative vascular invasion (7–9).

To our knowledge, previous studies stated variable negative predictive values of MDCT in evaluating pancreatic carcinoma with about 20–55% of patients incorrectly diagnosed as having resectable tumor on CT and found to have unresectable tumor at surgery. Most often, this type of misdiagnosis is due to undetected vascular invasion (7,8).

The aim of this study was to evaluate MDCT signs of preoperative vascular invasion in pancreatic carcinoma.

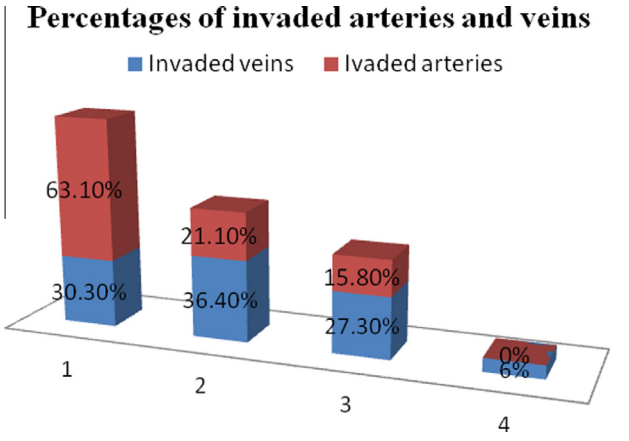


Fig. 1 Number and percentages of MDCT signs in invaded arteries and veins, (1) circumferential involvement (any degree for arteries, > 50% for veins), (2) vascular infiltration (wall irregularity), (3) caliber stenosis and (4) vascular occlusion.

2. Patients and methods

2.1. Study population

A retrospective review of preoperative dynamic MDCT studies of 42 patients (16 females and 26 males with ages ranging from 43 to 76 years, mean age 60.2 years) with pathologically proven pancreatic carcinoma who underwent operations (surgical resection, exploration or surgical bypass) was done at National Cancer Institute, Cairo University. Patients underwent surgical operations within 1–3 weeks after MDCT. 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 pre contrast 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).

Patients received about 500 ml of water about 1 h prior to scan and about 250 ml of additional water immediately before scanning for better assessment of peripancreatic vascular structures, followed by IV injection of nonionic contrast medium using a power injector.

MDCT scan was performed with the following acquisition parameters: 200 mAs, 120 kVp, 512 × 512 matrix, 1.1 pitch, 64 × 0.625 mm collimation, 1 mm slice thickness, 0.6 mm reconstruction increment.

Automated bolus tracking with bolus detection at the level of the descending aorta above the diaphragm ensured accurate timing of the data acquisition in the arterial phase.