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ORIGINAL ARTICLE

Staging chest computed tomography and positron emission tomography in patients with pancreatic adenocarcinoma: utility or futility?

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Abstract

Objectives: This study was conducted to determine if routine staging chest computed tomography (CT) or positron emission tomography (PET) scanning alters the clinical management of patients with newly diagnosed pancreatic adenocarcinoma.

Methods: All new pancreas cancers seen in medical oncology, radiation oncology and surgery from 1 June 2008 to 20 June 2010 were retrospectively reviewed. Patients with metastatic disease on chest CT or PET, that had been unsuspected on initial imaging, were identified.

Results: Pancreatic adenocarcinoma was present in 247 consecutive patients. Abdominal CT demonstrated metastases in 108 (44%) and localized disease in 139 (56%) patients. Chest CT and PET were not performed in 15 (11%) of these 139 patients. In the remaining 124 patients, CT imaging suggested resectable disease in 46, borderline resectable disease in 52 and locally advanced disease in 26 patients. Chest CT demonstrated an unsuspected lymphoma in one patient with borderline resectable disease and PET identified extrapancreatic disease in two patients with locally advanced disease. Chest CT and PET added no information in 121 (98%) of the 124 patients.

Conclusions: The addition of chest CT and PET to high-quality abdominal CT is of little clinical utility; additional sites of metastasis are rarely found. As the quality of abdominal imaging declines, the yield from other imaging modalities will increase. Dedicated pancreas-specific abdominal CT remains the cornerstone of initial staging in suspected or biopsy-proven pancreatic cancer.

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Introduction

Current National Comprehensive Cancer Network (NCCN) guidelines for staging patients with pancreatic adenocarcinoma have been revised to include a dedicated chest computed tomography (CT) scan to evaluate for lung metastases.[1,2] Pulmonary evaluation is important because the presence of pulmonary metastases will influence subsequent treatment recommendations, affect clinical trial eligibility, and have obvious implications for surgery directed at the primary tumour. For example, patients with resectable pancreatic adenocarcinoma (resectable primary tumour), in whom indeterminate lung lesions are found on imaging, are classified as borderline resectable according to the Katz classification (type B) in view of concern for distant metastases.[3] In such patients, resection of the primary tumour is usually not performed as the first treatment modality. Type B patients are generally offered neoadjuvant chemotherapy, with or without chemoradiation.[4–6] This strategy allows for the lung lesions to be further clarified over time, during which systemic therapy is provided to treat both local and potentially distant disease.

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Accurate staging tools are needed to improve preoperative patient selection and offer stage-appropriate therapies to patients with newly diagnosed cancer of the pancreas. Computed tomography of the chest and positron emission tomography (PET) can potentially influence the management of patients with resectable pancreas cancer. However, there are very few data to support the routine use of chest CT or PET scanning, or the combination of both, in these patients. Chest CT scanning has been shown to be more sensitive and specific than chest X-ray in identifying lung cancer and in identifying lung metastases in patients with periampullary tumours.[7,8] Lung metastases are often a later finding in patients who have already developed liver metastases, peritoneal carcinomatosis or malignant ascites. Many practices now incorporate CT and PET or combined CT/PET within the staging workup.[9–11] However, there is no firm consensus on the precise roles of these and additional staging studies in patients with newly diagnosed pancreatic cancer.

The present group hypothesized that staging chest CT and PET fail to identify new sites of disease beyond those seen in abdominal CT and chest X-ray in patients with newly diagnosed pancreatic cancer. If lung metastases were found in patients with disease that was otherwise considered to be resectable according to conventional imaging methods, such patients would not be considered for surgery. The aim of this study was therefore to determine if routine staging chest CT or PET scanning alters the clinical management of patients presenting with newly diagnosed pancreatic adenocarcinoma.

Table 1 Pulmonary nodule scoring system

Pulmonary nodule score	Lung findings
0 No evidence of malignancy	1 Normal lungs
	2 Stable pulmonary nodules for 2 years
	3 Homogeneous calcified nodules
	4 Opacities not related to malignancy (i.e. atelectasis, congestive heart failure, pulmonary scarring/fibrosis, emphysema)
1 Indeterminate	1 Solitary pulmonary nodules <5 mm
	2 Pulmonary nodules <5 mm with short-interval stability (<2 years)
	3 Pleural effusion, pleural plaques, and infectious/inflammatory ground glass and tree-in-bud opacities
2 Suspicious	1 Solitary pulmonary nodule of >5 mm
	2 Multiple pulmonary nodules
3 Definite metastasis(es)	1 Multiple, bilateral, peripheral, lower lobe pulmonary nodules of varying size (haematogenous spread)
	2 Diffuse nodular interstitial thickening (lymphangitic spread)
	3 New and/or enlarged pulmonary nodule(s) over time
	4 Biopsy-proven metastasis
	5 Malignant lymphadenopathy

Materials and methods

Subsequent to institutional review board approval, all new pancreatic cancer patients seen in the Departments of Medical Oncology, Radiation Oncology and Surgery at the Medical College of Wisconsin from 1 June 2008 to 30 June 2010 were retrospectively reviewed. Pancreas protocol CT (PPCT), chest X-ray, chest CT and PET were all re-reviewed by three of the present authors (SGP, APM, PPT). A pulmonary nodule scoring system designed to allow findings on these imaging studies to be objectively reviewed and compared was developed (Table 1). Although no specific criteria or definitions have been described for the evaluation of pulmonary metastasis in chest CT, the nodule scoring system was used to categorize the initial imaging studies of patients in the present series. In addition, PET scans were reviewed and qualitatively scored as positive or negative for additional suspicious findings in comparison with chest CT scans.

All patient examinations were reviewed with particular attention to the presence of suspicious pulmonary nodules. The majority of staging studies had been performed at the present institution; however, a subset of patients had already undergone imaging prior to evaluation at this institution. In this scenario, these studies were added to the present institution's imaging archive and were evaluated. Outside examinations were included only when deemed diagnostic by the interpreting radiologists and were excluded if they presented artefact or technical inadequacy. Examinations were reviewed retrospectively by two experienced radiologists. Examination findings were categorized accordingly by consensus. A third radiologist reviewed any cases in which disagreement occurred.

Patients with newly diagnosed pancreas cancer were clinically and radiographically staged based on CT imaging findings and clinical performance status.[5,6] Resectable disease (stage I or II) was defined, based on CT images, as a normal tissue plane between the tumour and adjacent arterial structures and a patent superior mesenteric vein–portal vein (SMV–PV) confluence. Patients with borderline resectable disease represented three different subtypes as previously described (Katz types A, B and C).[3] Type A patients had tumour abutment (≤180 °) of the superior mesenteric or coeliac arteries and an occluded SMV–PV confluence with an adequate segment of vein above and below the area of tumour involvement to allow for venous resection and reconstruction. Type B and C patients included those with questionable metastatic disease and marginal performance status, respectively. Locally advanced (stage III) tumours were considered as those that exhibited tumour encasement (>180 °) of the adjacent arteries or an occluded SMV–PV confluence with no technical option for venous reconstruction. Patients with metastatic disease (stage IV) at presentation had radiographic evidence of liver, lung, peritoneal or other sites of distant metastases.[1]

Patients with non-pancreatic periampullary tumours, and those with pancreatic tumours that were not adenocarcinomas