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Case Report

Solitary metastasis to the head of the pancreas from lung adenocarcinoma mimicking pancreatic ductal adenocarcinoma: A case report ☆

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ABSTRACT

Solitary pancreatic metastasis is a rare cause of pancreatic neoplasm. Pancreatic ductal adenocarcinoma is the primary differential consideration when a solitary pancreatic mass is diagnosed, as it is the most common solitary solid pancreatic neoplasm. A majority of pancreatic ductal adenocarcinomas arise in the region of the head of the pancreas; however, specific neoplastic and non-neoplastic lesions can occur at or adjacent to the pancreatic head, which can mimic a pancreatic ductal adenocarcinoma. Therefore, a histopathological diagnosis is essential for confirming pancreatic ductal adenocarcinoma. Isolated solitary metastasis from primary lung adenocarcinoma is a rare cause of a solitary pancreatic head mass. We report a case in which imaging and pathology were integral to the diagnosis of a solitary lung adenocarcinoma metastasis to the head of the pancreas, which ultimately guided appropriate patient management.

Introduction

Metastases to the pancreas are an uncommon cause of a neoplastic process involving the pancreas [1]. Renal cell cancer is the most common cause of metastatic disease to the pancreas, followed by lung cancer [2]. However, it should be noted that the pancreas is not a common site of metastasis from lung cancer. Lung cancer commonly metastasizes outside the thoracic cavity to the liver (34%), adrenal glands (33%), bones (15%), central nervous system (12%), and kidneys (11%). Only about 5% of metastatic lung cancers spread to the pancreas [3]. Among lung cancers, metastases from small cell lung cancer, the most common cause of pancreatic metastases, are 5 times more common than metastases from lung adenocarcinoma [4]. A multiplicity of lesions favors metastases as an etiology. However, when there is a solitary pancreatic lesion in the absence of metastases elsewhere, especially in the

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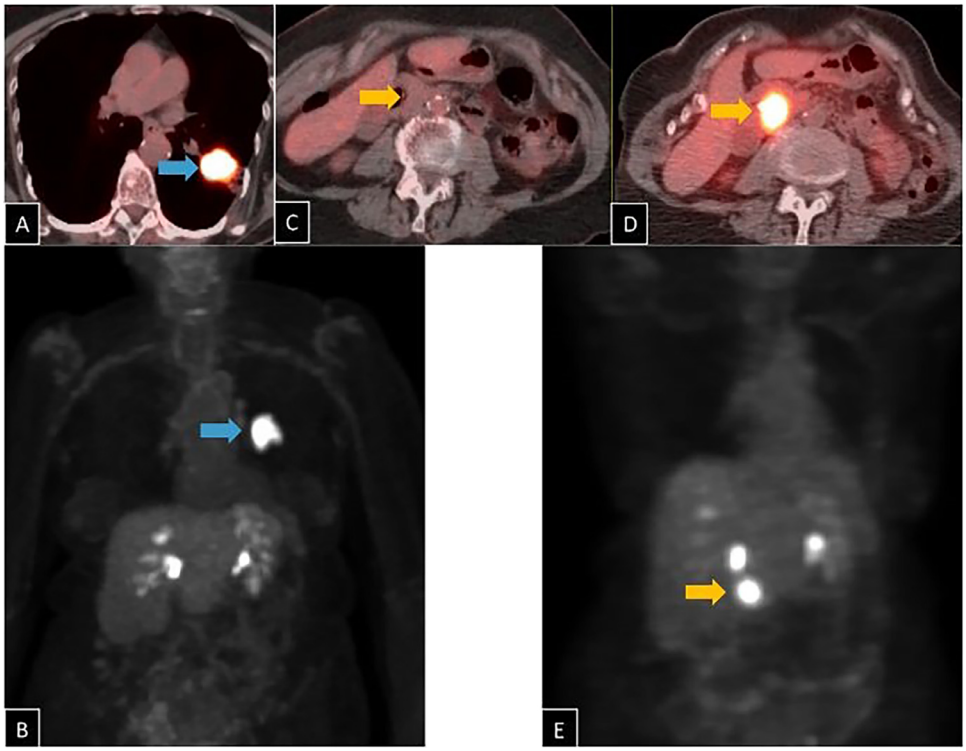

Fig. 1 – (A and B) Axial and coronal maximum intensity projection (MIP) images of the PET-CT study performed for metastatic work-up of lung adenocarcinoma demonstrating an FDG avid mass in the left lung (blue arrow) with no other areas of abnormal FDG uptake. (C) Axial PET-CT image of the same PET-CT study at the level of the head of the pancreas demonstrates no focal uptake. (D and E) Axial and coronal maximum intensity projection (MIP) images of the PET-CT performed after the diagnosis of the pancreatic head mass demonstrated an FDG avid mass (orange arrow) in the region of the head of the pancreas with no other areas of abnormal FDG uptake. On the coronal MIP images, expected tracer uptake in the bilateral renal collecting systems is also seen.

setting of no metastatic disease on prior imaging work-up of a known malignancy, it raises a concern for pancreatic ductal adenocarcinoma. We report a rare case where there was a solitary pancreatic head metastasis from lung adenocarcinoma mimicking a pancreatic ductal adenocarcinoma.

Case report

A 74-year-old female patient with a history of hypertension and lung cancer presented to her primary care physician with painless jaundice. Three months prior, the patient had undergone left anterolateral thoracotomy and extended left lower lobe lobectomy for stage II lung cancer with final postsurgical pathology consistent with a pT2bN0 poorly differentiated lung adenocarcinoma. Upon subsequent presentation with painless jaundice, she underwent an endoscopic ultrasound, which showed a 1.8 cm hypoechoic pancreatic head mass obstructing the common bile duct, prompting an endoscopic ultrasound-guided fine needle aspiration. Cytology revealed malignant cells consistent with adenocarcinoma.

Postendoscopic ultrasound, a fluorodeoxyglucose (FDG) positron emission tomography-computed tomography (PET-CT) was performed for further workup at an outside hospital. It demonstrated an FDG avid pancreatic head mass (Fig. 1) and no other areas of abnormal FDG uptake. Of note, 4 months prior, a PET-CT performed for metastatic workup before the resection of the lung adenocarcinoma was negative for metastatic disease (Fig. 1), and a presumptive diagnosis of primary pancreatic adenocarcinoma was made. The patient was then referred to our institution for staging and evaluation for Whipple's procedure. Abdominal MRI was performed as a part of the staging work-up and demonstrated a 2.2 cm well-circumscribed, T2 hyperintense, and heterogeneously enhancing pancreatic head mass, which was hypoenhancing when compared to the normal pancreatic parenchyma (Figs. 2A-D). Associated dilatation of the common bile duct and the main pancreatic duct (double duct sign) was present. Given the mass demonstrating hypoenhancement on the arterial phase when compared to the normal pancreatic parenchyma with associated dilatation of the main pancreatic duct and common bile duct, a primary differential consideration of pancreatic ductal adenocarcinoma was considered as it is the most likely differential of a pancreatic head mass specifically in the setting of a hypoenhancing mass. The findings that were against the diagnosis of a pancreatic ductal adenocarcinoma were that the mass appeared well delineated without infiltrative margins, contrary to the infiltrative nature of pancreatic ductal adenocarcinoma and the fact that

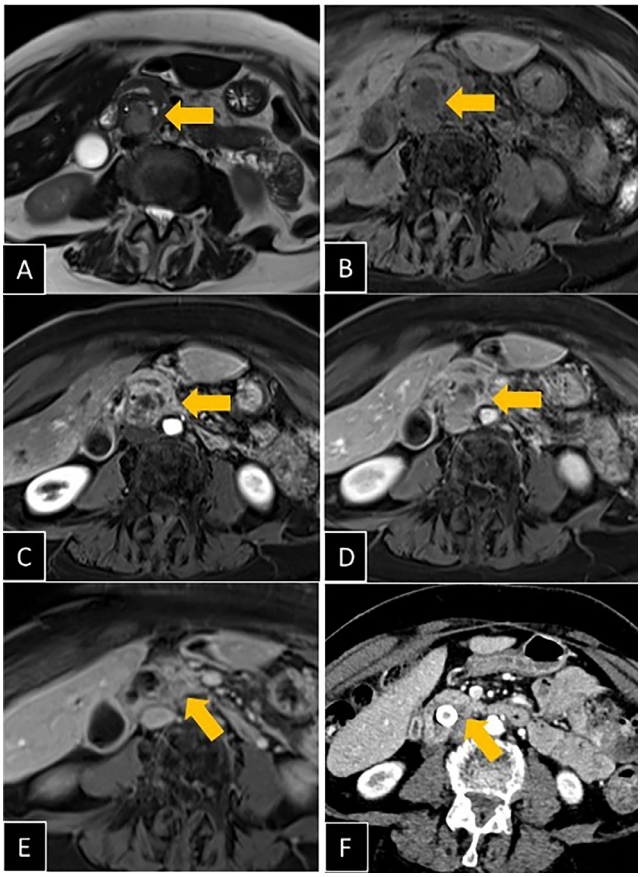

Fig. 2 – (A-D) Axial T2, precontrast T1, arterial phase postcontrast, and venous phase postcontrast images, respectively, showing a well-defined T2 mildly hyperintense, T1 hypointense mass, with progressive postcontrast enhancement (orange arrows). (E) Axial postcontrast T1-weighted image of MRI study performed 1 month later, postchemotherapy, demonstrating interval decrease in size of the tumor suggestive of favorable treatment response. (F) Axial contrast-enhanced CT image of 1-year follow-up CT study demonstrating further interval decrease in size of the tumor.

the patient had a prior history of lung adenocarcinoma, and the histopathology of the pancreatic mass raised of the possibility of an adenocarcinoma [5].

Given MRI features, the histopathology slides were re-examined at our institution and tested for pancreatic and lung adenocarcinoma immunohistochemical markers. The neoplastic cells were focally positive for CK7 and TTF-1 markers, which are markers of lung adenocarcinoma, and were negative for CA19-9, CK20, and p53, which are markers for pancreatic ductal adenocarcinoma, favoring lung adenocarcinoma metastasis. This led to appropriate patient management, preventing unnecessary surgical intervention in a metastatic cancer patient who would otherwise have undergone a Whipple's procedure, which is the standard of care for a resectable pancreatic head adenocarcinoma. The patient was managed medically, and the 1-year follow-up CT demonstrated a good treatment response to chemotherapy and immunotherapy, with a marked interval decrease in the tumor size (Figs. 2E and F). The timeline of events is described in detail in Fig. 3.

Discussion

Pancreatic ductal adenocarcinoma is the most common solid pancreatic mass, constituting more significant than 85% of the solid pancreatic neoplasms [6]. Pancreatic adenocarcinoma is most commonly seen in the pancreatic head, with about 65% of the tumors arising in the head region [7]. Imaging is integral in the diagnosis of a pancreatic head mass. CT and MRI are equally accurate in diagnosing and staging pancreatic head masses [8].

Typically, pancreatic ductal adenocarcinoma involving the head region presents as an ill-defined infiltrative hypoenhancing mass on computed tomography (CT) and magnetic resonance imaging (MRI). It is best appreciated in the arterial phase of contrast-enhanced CT/MRI. Additionally, due to the malignancy's infiltrative nature, it can cause ductal obstructions and is associated with upstream dilatation of the common bile duct and the main pancreatic duct, commonly known as the double duct sign. Distal pancreatic atrophy can also be associated. There is a propensity for vascular encasement and perineural spread [5,6,9]. Pathological masses that arise in the pancreas can be grouped into hypoenhancing/isoenhancing versus hyperenhancing masses, comparing the enhancement of the mass with the enhancement of the background pancreatic parenchyma. If there is a focal isoenhancing/hypoenhancing pancreatic head mass, pancreatic adenocarcinoma is the primary differential consideration [5,10].

Neoplastic etiologies in the pancreatic head region that mimic a pancreatic ductal adenocarcinoma include hypoenhancing masses arising in the pancreas, or masses adjacent to the pancreas which closely abut or infiltrate the pancreatic head. Masses in the pancreatic head include uncommon primary pancreatic head neoplasms, lymphoma, and solitary pancreatic head metastasis. Metastatic lymphadenopathy in the periportal region can closely abut the head of the pancreas and mimic a mass arising from the pancreas. Other neoplastic etiologies arising adjacent to the pancreas include cholangiocarcinoma involving the terminal common bile duct and ampullary adenocarcinoma. Non-neoplastic etiologies that can mimic pancreatic ductal carcinoma include a mass forming chronic pancreatitis, groove pancreatitis, and autoimmune pancreatitis [5]. Hyper-enhancing pancreatic masses include pancreatic neuroendocrine tumors and hypervascular metastasis, most commonly neuroendocrine, renal, and melanoma metastasis [5,11]. The differential diagnoses of a solitary pancreatic head mass are summarized in Fig. 4.

Metastatic disease of the pancreas constitutes a minuscule proportion (2%) of pancreatic malignancies. Metastatic involvement can be in the form of multiple pancreatic lesions, which can be seen in about 5% to 10% of the patients, as diffuse infiltration of the pancreas accounting for about 15%-44% of the patients, and as a solitary, isolated mass seen in about 50%-75% of the patients. Renal cell cancer accounts for more than 60% of pancreatic metastases, followed by lung cancer

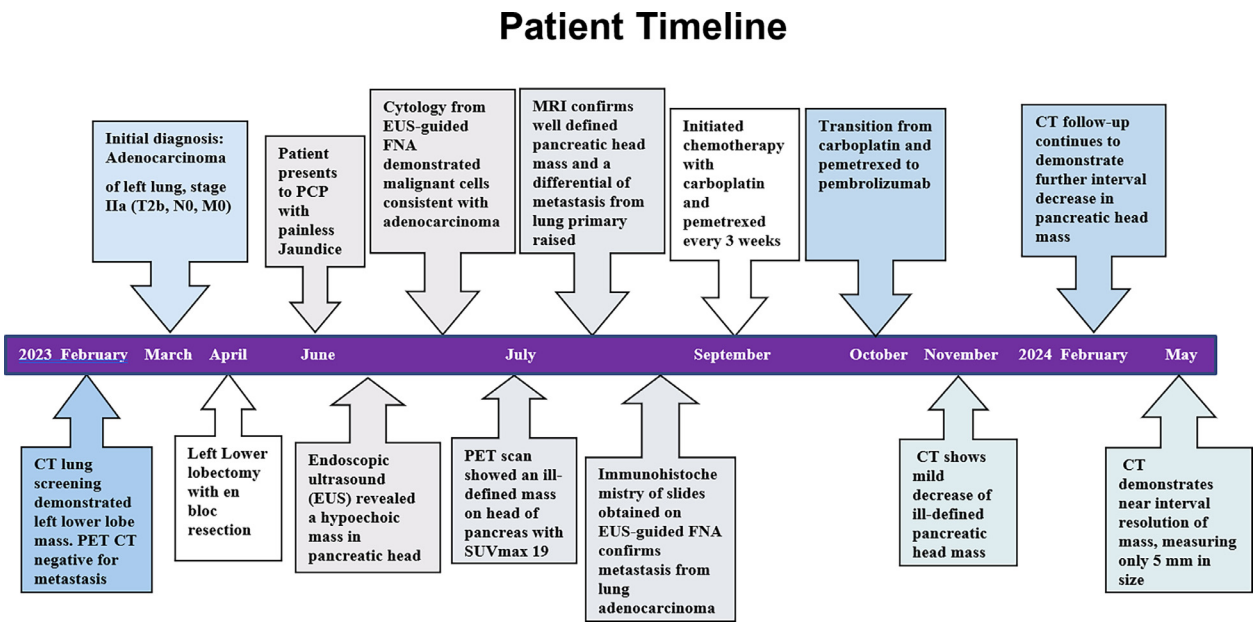

Fig. 3 – Timeline of events.

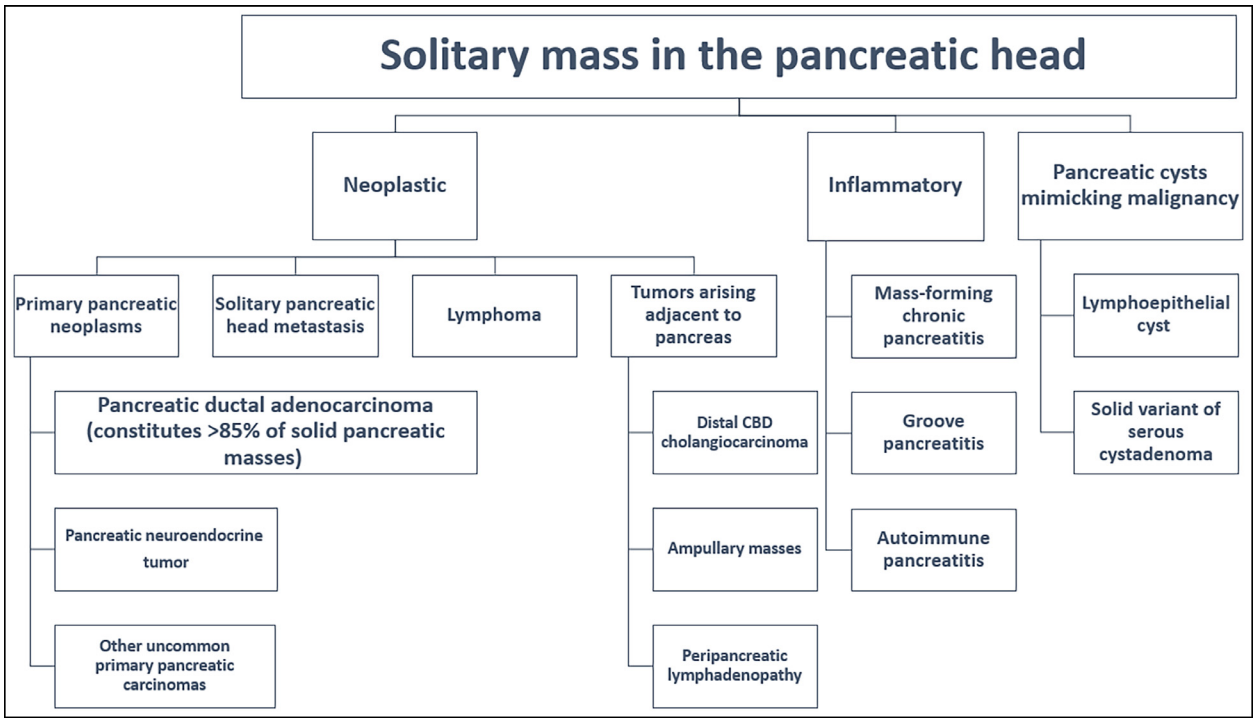

Fig. 4 – Differential diagnosis of a solid pancreatic head mass.

and melanoma [2]. Other primary malignancies metastasizing to the pancreas include cancers of the breast and colon and metastatic sarcoma [12]. Metastatic disease of the pancreas can be asymptomatic, with diagnosis incidentally found on imaging as part of metastatic work-up. If the metastatic disease involves the pancreatic head region, it can present as obstructive jaundice. Rarely, it can present as acute pancreatitis caused as a result of obstruction of the main pancreatic duct [2].

Metastatic lesions to the pancreas demonstrate a round or ovoid morphology and appear relatively well-marginated. Infiltration along the pancreatic vasculature is less common, unlike primary pancreatic ductal adenocarcinoma [13]. Metastasis to the pancreas may be broadly classified into hypoenhancing and hyperenhancing lesions. Solitary hypoenhancing pancreatic metastasis is a differential consideration for pancreatic ductal adenocarcinoma, the most common hypoenhancing pancreatic mass. Hypovascular pancreatic metastases

include metastasis from the lung, breast, and colorectal cancer metastasis [5,14]. The primary differential consideration for a hyperenhancing pancreatic mass is a neuroendocrine tumor. Solitary pancreatic metastasis from renal cell cancer, melanoma, and neuroendocrine tumors are differential considerations for a solitary hyperenhancing pancreatic mass [5,11].

Common sites for extrathoracic lung cancer metastases include liver, brain, adrenals, and bones. Pancreatic metastases from lung cancer are rare, with an incidence quoted between 5% and 11% in the literature [4]. The incidence varies according to the histological subtype, with small cell lung cancer being the most common to metastasize to the pancreas (12%), followed by adenocarcinoma being the second most common (2.4%), squamous cell (1.9%), and then large cell (1.1%) [4]. A retrospective study on pancreatic metastases from lung cancer done by Maneo et al. showed that the most typical pattern of pancreatic involvement is a solitary pancreatic mass (73.1%), followed by diffuse involvement (15.4%) and multiple pancreatic masses (11.4%) [15]. As metastatic spread to the pancreas is usually seen in advanced lung cancer, prognosis is generally poor, with surgical intervention being rare and treatment primarily involving radiotherapy and/or chemotherapy [16].

Shadhu et al. [1] reported a similar case where there was a metastasis to the pancreatic tail after 2 years of resection of the primary lung adenocarcinoma. In their case, the diagnosis was made on histopathology postsurgical resection. Akpoviroro et al. [4] reported a case where there was isolated pancreatic metastasis in the setting of a patient undergoing chemoradiotherapy for inoperable lung adenocarcinoma. Zhou et al. [17] reported a case of an isolated pancreatic metastasis from a squamous cell lung carcinoma mimicking a primary pancreatic ductal adenocarcinoma. Previous studies have shown that patients with metastatic pancreatic malignancies originating from a lung primary typically have a median latency of 20 months and an average latency of 21.9 months [16]. Our patient was diagnosed with biopsy-proven primary lung adenocarcinoma in March 2023. Following a left lower lobectomy with en bloc resection in April, the patient presented in June with metastasis, which occurred just over 3 months from the primary diagnosis—an unusually short timeline. A study by Yoon et al. [18] found that less than 0.28% of metastatic pancreatic lesions are associated with non-small cell lung carcinoma. The early latency and less than 1 percent occurrence of this patient's metastatic pancreatic malignancy makes our case unique.

Clinical significance

It is necessary to differentiate pancreatic ductal adenocarcinoma from the other neoplastic and non-neoplastic etiologies of a solitary hypoenhancing pancreatic head mass, as the appropriate management depends on the accurate diagnosis of the etiology. A histopathological confirmation is therefore crucial to confirm the diagnosis of pancreatic ductal adenocarcinoma before further management [5,11]. Tissue sampling can be performed either through endoscopic ultrasound-guided or percutaneous tissue sampling. Whipple's procedure is performed for operable pancreatic ductal adenocarcinoma and other neoplastic etiologies and non-neoplastic pathologies of the pancreatic head for which surgery is indicated, while it may or may not be the treatment for choice for different etiologies of a solitary pancreatic head mass [11].

Limitations

Pancreatic ductal adenocarcinoma and pancreatic neuroendocrine tumor are the most common hypoenhancing and hyperenhancing solitary pancreatic masses, respectively. Imaging helps in narrowing the differential diagnosis. However, if a solitary pancreatic mass is managed based on imaging alone, there is a possibility of mismanagement. A multidisciplinary approach by the radiology, pathology, gastroenterology, and surgery/surgical oncology teams is essential in patient management.

Conclusion

Although pancreatic ductal adenocarcinoma is the most common solid pancreatic tumor, other neoplastic and non-neoplastic processes can occur in the pancreas, which can mimic a pancreatic ductal adenocarcinoma. Imaging and pathology are vital in the diagnosis and appropriate patient management. The learning points from the present case report are a) Although metastatic disease is a rare cause of a solitary pancreatic mass, it should be included in the differential in the setting of a known primary malignancy, b) Isolated solitary pancreatic metastasis can occur in the absence of metastatic disease elsewhere in the body, and c) Pancreatic metastatic disease can occur even though the primary malignancy appears to be well controlled/satisfactorily treated.

Patient consent

The subject has been acknowledged and approved by the IRB.

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